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LECTURES

ON THE

PRINCIPLES AND PRACTICE

OF

MEDICINE.

DELIVERED IN

CHICAGO MEDICAL COLLEGE, MEDICAL DEPARTMENT OF THE NORTHWESTERN UNIVERSITY,

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1342

BY

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PREFACE.

The lectures comprised in this volume, embrace substantially the course of instruction on the principles and practice of medicine given by me in the Medical Department of the Northwestern University, better known as the Chicago Medical College. My method of lecturing being entirely extempore, the lectures comprising the first half of the volume, under the heads of Principles of Medicine and Acute General Diseases, were originally reported by Leander Stone, stenographer; and those comprising the rest of the volume, by James E. Henderson, M. D. All the manuscript has been fully revised, and not a small portion re-written by me in the midst of so great an amount of other professional and literary work, that it has been impossible to bestow upon it sufficient minuteness of attention to avoid all errors in typography and modes of expression.

Three motives have combined to induce me to endure the labor of preparing these lectures, and superintending their publication at the present time. One was to comply with the expressed wish of a large number of practitioners who have honored me with their presence in the lecture room of the college and the clinical wards of the hospital, during some part of the thirty-five years that I have been engaged uninterruptedly in the work of teaching medicine. Another was the desire to place within the reach of medical students, a work on practice which embodies in its text the metric system of weights and measures, and thereby greatly facilitate the change which has been declared by nearly all our social professional organizations to be desirable. This change from the apothecaries' system to the metric, has progressed just far enough to give us throughout our current medical literature a most undesirable mixture of both systems. To render the transition complete in a brief period of time, it is only necessary that the authors of practical works should incorporate the metric system into the text of their volumes. To prevent embarrassment on the part of the great body of practitioners who have already been educated exclusively in the apothecaries' system, the latter might be given as equivalents in brackets, as has been done throughout all the lectures embraced in this volume.

The third motive was a desire to place on record, accessible to the profession generally, those views and modes of practice developed in my own mind, as a result of fifty years of constant devotion to the study and practice of the healing art, on a field amply sufficient for both scientific study and direct clinical observation.

N. S. DAVIS.

65 Randolph St., Chicago, Sept. 8, 1884.

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PART I.

ELEMENTARY CONSIDERATIONS, OR PRINCIPLES OF MEDICINE.

LECTURE I.

Definitions of Disease—A knowledge of what constitutes health necessary to a clear conception of Disease—Analysis of Health—The Fluids—The Solids—Their properties and relations—Elementary Properties—Elementary Functions—Tabular Statement.

GENTLEMEN: In investigating the principles and practice of medicine, whether in the lecture-room or in the hospital-wards, morbid action and disease in its various forms, tendencies and results, will constitute the primary theme of discussion and observation.

To determine the exact pathological condition of the patient, is the first object of every enlightened practitioner when called to the bed-side of the sick. Having done this, he sees clearly, both the tendencies of the case, and the indications to be fulfilled by the employment of remedial agents. If the practitioner comprehends fully the nature, extent and tendencies of the disease before him, and sees distinctly the objects to be accomplished by treatment, he will find it comparatively an easy task to select and apply the appropriate remedies. Hence, while standing here upon the threshold of the present course of instruction we are confronted with the question: What is *morbid* action or *disease?* Most of the modern writers and teachers in this department, simply reply, that disease is a deviation from health in some one of the structures or functions of the human system.

This, instead of explaining anything however, simply necessitates another question, namely: What is *health?* And if the answer is made in the usual manner, that *health* is the natural condition of the structures and functions of the human body, it simply changes the phraseology without advancing our knowledge of the subject. If disease is merely a departure from a healthy or natural condition of some structure or function, it is evident that a clear and accurate knowledge of what constitutes the proper standard of health, both in regard to structural organization and functional action, affords the only basis on which we can appreciate such deviations from that standard as constitute morbid action or disease. To gain a full and accurate idea of health as a base-line or point of departure for studying the elementary forms of disease, it is necessary to subject the animal economy to a proximate analysis sufficient to display the several elementary structures, their properties, their mutual relations, and their special functions. By such analysis we may resolve all the materials of the body, first, into *fluids* and *solids*. The first consists of the blood and

the various products of secretory action; and the second, of the organized living structures and the solid inorganic materials deposited in them. The blood is a very complex fluid, containing all the products of digestion and assimilation on the one hand, and the primary products of disintegration or waste of structures on the other, together with certain elementary forms of organization known as red and white corpuscles. Hence its constituents or proximate elements may be arranged under three heads, viz:

1st. Such elements as are nutritive, that is, designed to supply the waste of tissues, as albumen, white corpuscles, fatty matter, certain salts, and oxygen.

2d. Such as are derived from the disintegration of tissues and are consequently effete, as fibrin, extractive matter, certain salts, and carbonic acid gas.

3d. Such as possess, at least, a partial organization and vitality, and serve their purpose in the blood, as the red corpuscles.

The secretions of the animal economy may be divided into three classes, viz:

1st. Such as are wholly effete or excrementitious, and consequently cannot be retained without producing a disturbing or injurious influence. To this class belong the eliminations from the skin, lungs, kidneys, and mucous membrane of the intestines.

2d. Such as are retained for the accomplishment of some specific purpose in the system, and are either reabsorbed or disappear by entering into new combinations of a harmless character. To this class belong the salivary, gastric, and pancreatic secretions, all of which enter into combination with the elements of food and disappear in the processes of digestion and assimilation. To the same class also belong the secretions from the serous, mucous, and synovial membranes that serve to moisten or lubricate their surfaces.

3d. Such as are partly excrementitious and partly retained to aid in the processes of digestion and assimilation. The bile is the most prominent sample of this class, the alkaline constituents of which undoubtedly enter into combination with the oily ingredients of chyme in the duodenum, while its coloring matter and cholesterin are as certainly effete and are discharged with the fœces.

For a detailed statement of the composition, properties, and uses of the blood and secretions, I must refer you to the departments of physiology and organic chemistry. But those of you, gentlemen, who have confined your reading principally to the works of English and American writers on physiology, may be surprised to hear me mention the fibrin of the blood in the class of wholly effete substances. For, until a very recent period, it was almost universally regarded as a product of assimilation, at least partially endowed with vitality, and designed to enter largely into the nutrition of the tissues. Such was the view taken of this substance by Carpenter, Williams, Paget, Dunglison, and many other writers of an earlier date.

Zimmerman was perhaps the first to seriously call in question the correctness of this doctrine, and to suggest that the fibrin of the blood was an effete constituent, derived from the disintegration of tissues, and designed for excretion. It was shown by Nasse and Müller that there is no fibrin in chyme, and but a very small quantity in the chyle of the lacteals, while it is abundant in the lymph of the lymphatics It is universally acknowledged to be more abundant in the blood during the progress of the active phlegmasia, than in health. It has also been found in excess in the blood of persons anemic either from loss of blood, want of food, or the suppression of some important secretion, as well as in the advanced

stages of tubercular phthisis. Indeed, a careful and extended series of clinical observations, long since, led me to believe that whenever the processes of disintegration or waste of tissues continued active, while the secretory action of the kidneys was diminished, fibrin accumulated in the blood in quantity above the natural proportion. As these conditions, whether arising from the influence of an active local inflammation, or from anemic and debilitated states of the system are almost always associated with loss of appetite and impaired or suspended digestion, it is extremely difficult to account for the increase of fibrin on the supposition that it is a product of digestion and assimilation. But its accumulation under such circumstances is in perfect harmony with the theory that it is one of the primary products of disintegration. While investigating this subject in the autumn of 1850, it occurred to me that a careful comparison of the relative proportion of fibrin in the blood of the renal vein returning from an active excretory organ, with that in the iliac vein returning from non-secreting structures, together with that in the arteries, would go far towards demonstrating fully the question whether fibrin was a nutritive or effete constituent of the blood. The only attempt of this kind, which I could then find on record, was made by Simon,* who procured the blood from the renal vein, the hepatic vein, and the aorta of a horse, and subjected each specimen to an analysis with special reference to the relative proportions of water, albumen and fibrin. These results showed of fibrin in the blood from the aorta, 8.2 parts in the 1,000; in that from the hepatic vein, 2.5 parts in the 1,000; in that from the *renal* vein, *none.* These results obtained by Simon, though strongly corroborating the view that fibrin is effete, were diminished in value by the fact that the horse from which the blood had been obtained was not healthy and well fed, and the quantity of blood obtained from the renal vein (only 50 grains), was insufficient to determine accurately the proportion of fibrin.

To obviate these objections, and at the same time to add another important element to the comparison, I selected a good sized, healthy dog, and while stunned by a blow on the head quickly opened the abdomen, passed a ligature around the renal vein near its junction with the ascending vena cava, and from a puncture in it received into a cupping glass 590 grains of blood for analysis.

A ligature was next passed around the iliac vein, and through a suitable puncture 771 grains of blood flowed readily into another cup. A third specimen, amounting to 425 grains, was then obtained from the left ventricle of the heart. On subjecting these several specimens of blood to a careful quantative analysis, that from the renal vein was found to contain twenty per cent. less fibrin than that from the left ventricle, while that from the iliac vein contained about ten per cent more.† Robin, Bernard, and others have since shown that the blood from the hepatic vein also contains less fibrin than that from the jugular vein or from the vena cava The fact thus clearly established, that the quantity of fibrin diminishes while the blood is passing through the principal excretory or-

*See Simons' Chemistry of Man, page 139.

†See an experimental inquiry concerning some points in the vital processes of assimilation and nutrition, published in the North Western Medical and Surgical Journal, p. 169, vol. 4, 1851. The analytical results referred to are as follows:

	Arterial Blood.	Blood from Iliac Vein.	Blood from Renal Vein.
Water	812.2	811.9	803.4.
Red corpuscles	82.5	92 7	92.2.
Fibrin	2.2	2.5	1.7.
Albumen (fat and extract matter not separated.	98.1	89.5	98.5.
Salts	5.9	3.9	4.2.

gans, and increases while passing through muscular and non-secreting structures, shows conclusively its effete character, and leaves no reason for hesitation in classing it as one of the primary products of disintegration, or waste of the tissues. This brief review, and classification of the more important natural constituents of the fluids of the body, will be sufficient for our present purpose, with the additional remark that when all these constituents exist in their natural relative proportions and natural qualities, without the intermixture of deleterious foreign ingredients, the fluids present the proper standard of health.

The solids, or organized structures, that enter into the formation of the living animal body, may, for our present purpose, be resolved into five proximately elementary forms of organization, namely: the nervous, the muscular, the capillary vascular, the secretory, and the fibrous. I do not mean that these are the elementary or primary forms of organic matter, but the elementary forms of organized structure, each of which is capable of performing a distinct function. Of these five elementary structures, with the addition of certain inorganic materials, all the complex tissues and organs of the human body are composed.

Whether these several distinct structures or primary tissues are each composed of elementary cells united in a definite manner, as claimed by a large majority of the histologists of the present day, or non-cellular organic atoms, we leave for our distinguished colleague in the chair of histology, to demonstrate to you. For whatever may be the primary form of organization, whether a cell, a nucleus, a granule, or an atom; a little reflection will make it apparent to each one of you, that the same properties or forces would be required to effect their union in such definite modes as to form in one case a muscular fibre, in another a nerve fibre, in a third a white or yellow elastic fibre, in a fourth a secreting cell, and in a fifth a capillary tube. Hence it is not so much the form of the primary organic atom that interests us, as it is the properties or forces with which it is endowed, and which control its movements, its combinations, and its ultimate destiny. An investigation of the former could do but little more than gratify a laudable curiosity, while on the correctness of our appreciation of the latter depends the clearness of our conceptions in regard to the essential phenomena of of life and organic changes, both in health and disease.

What, then, are the properties, if any, with which living organized matter is endowed?

Perhaps no subject in the whole range of medical sciences has been left involved in greater obscurity than this. That living organized matter is possessed of certain properties which give to its changes and developments certain determinate directions, and enable it to resist the action of such agencies as control the changes in inorganic or dead matter, has been plainly acknowledged from the most ancient records of medical opinions to the present time.

The ancients regarded these properties as purely chemical or physical, as developed in the various modifications of the humoral theories of concoction, fermentation, etc.; or as some superadded essence, spirit, or controlling anima as represented in the earlier theories of solidism, and more fully developed by Stahl and his disciples. It was not until Haller had clearly demonstrated the existence of an inherent property in the muscular structure, which he styled "*irritability*," that we find a distinct recognition of a property or force in organized matter neither dependent on, nor necessarily connected with, the immaterial spirit or soul. He, however, restricted the existence of this property to muscular

fibres alone; and failed to make any clear distinction between the elementary property inherent in the living fibre and the function or office performed by such fibre. The latter error has prevailed to a greater or less extent in the writings and teachings of all the advocates of solidism or vitalism even to the present time. Thus Dr. Williams, in his Principles of Medicine, speaks of irritability and tonicity, as elementary *properties* of muscular structures, while he calls sensibility and transmisibility *functions* of nerve structures. Dr. Martyn Paine, in his Institutes of Medicine, claims one vital principle, which he considers as synonymous with vitality or life, and which pervades all living matter. This vital principle he endows with six properties, namely, *irritability*, *mobility*, *vital affinity*, *vivification*, *sensibility*, *nervous* power. Now, gentlemen, *tonicity* as explained by Dr. Williams means simply a certain degree of muscular contraction, and consequently is as purely a function of the muscular structure as sensibility is of the nervous. So, the mobility, sensibility and nervous power of Dr. Paine, are plainly *functions* of the muscular and nervous tissues; and yet he classes them in the same catgeory with irritability and vital affinity, which are really properties common to all tissues. Dr. Samuel Jackson, of Philadelpha, in his work on the Principles of Medicine, exhibits a much more correct appreciation of the distinction between elementary properties common to all the tissues, and elementary functions of particular parts. But since the more complete development of the physiology of the nervous tissues, the great majority of medical writers have completely confounded all elementary properties with nerve sensibility, or, as they term it, nerve force; and have consequently recognized no capacity for receiving impressions or modifications of actions in the several elementary structures, except through the medium of nerve matter. Hence you will find most of the writers on pathology and practical medicine, endeavoring to trace the primary actions of all morbific causes, to an impression, either directly on the constituents of the blood or upon some part of the nervous system. This error has not only caused many important questions in pathology to remain involved in obscurity, but has also equally retarded the progress of our knowledge concerning the *modus operandi* of our remedial agents. That there are certain properties inherent in all organized matter, so long as it retains the capacity to exhibit the phenomena of life, is evident from facts familiar to all of you. Take, for example, the simplest form of organization—the germinal cell of the ovum or the chit or germinal part of the vegetable seed. Each is destitute of all trace of either capillary vessels or nerves, yet each is susceptible to the impressions of certain exterior agents or influences; and whenever these are applied, a series of regular and determinate changes commence, constituting the active phenomena of life.

It requires but a moment of careful, logical thought to recognize here the existence of two inherent elementary properties: one imparts to the cell or germ the capacity to receive impressions, and hence, I have called it, *susceptibility*. The other causes the atomic changes which result from the impressions received, to follow certain laws, both in the addition of new atoms and the liberation of old ones; and I have therefore called it *vital affinity*. Susceptibility and vital affinity are the elementary properties of all organized living matter. It is the possession of these properties that gives to the protoplasm of Mr. Huxley and the bioplasm of Mr. Beale, all their peculiarities and capabilities of development. It would be a waste of your time to speculate as to the nature of these properties. They constitute the peculiar and elementary forces of the organic world, and can be recognized and studied only by their effects, in the same

manner that we recognize and study the imponderable or elementary forces of the inorganic world, as heat, electricity, attraction, etc. You suspend two inorganic substances in the same cup of water, and if they unite, forming a new material, you say the union was the result of a property or force in the combining bodies, which you call chemical affinity. You do not see this property or force, yet for that reason you do not doubt its existence. So if we place the germinal cell of the animal or vegetable in certain relations, we find it uniting with other atoms of matter, and forming—not a new and homogenious compound, as in the display of chemical affinity—but a complex and progressive series of additions constituting growth or development, and I call the property or force in the germinal cell by which these changes are effected, *vital affinity*. These properties—susceptibility and vital affinity—are elementary, and inherent in all organized living atoms of matter, however dormant such atoms may appear to be. Deprive the germ, whether animal or vegetable, of these properties, and it immediately becomes subject to the same laws and forces that govern inorganic matter. Expose it to warmth and moisture ever so sedulously, and instead of the phenomena of life, you have only those of disintegration and decay. To recognize the existence of these properties and learn how far they are capable of being acted upon and modified by exterior forces and influences, is a very important part of the study of physiology and pathology.

In another part of this lecture it was stated to you that all the organized parts of the body can be resolved anatomically into five primary structures, namely—nervous, muscular, secretory, vascular, and fibrous. The elementary properties, susceptibility and vital affinity, are general, and belong equally to all the primary structures. And each of these structures thus endowed with the elementary properties, is capable of performing certain acts or serving certain purposes which constitute the special or primary function of such structure. For example, the nervous tissue receives and transmits impressions ; the muscular contracts ; the secretory elaborates some special fluid called a secretion ; the capillary vascular allows the active passage of fluids, and at the same time permeation and imbibition, exosmose and endosmose, through its walls ; while the fibrous tissue simply affords both a support and a bond of union to all the other structures. Hence, we may conveniently designate the primary functions as follows :

Nerve structure	Sensibility. Transmissibility.
Muscular structure, ...	Contractility.
Secretory structure, ...	Secretion.
Capillary vascular structure, ...	Movement of fluids.
Fibrous structure, ...	Elasticity.

You have already learned in your course on histology that these several primary structures are formed by the union of cells or organic atoms, varying from each other both in their form and the manner of their union; such variations constituting the apparent differences between one structure and another. You have also learned that the same primary structure is not homogenious throughout, but presents diversities in the union of its primary atoms or cells. The nerve structure, for instance, presents in some places its cells aggregated in masses, as in the ganglia of the sympathetic and spinal nerves, and in the gray matter of the brain and spinal cord, and in other parts they are united in linear form, constituting fibres, as in the white portion of the brain, spinal cord and nerves. The former

indicates the function of sensibility and the active generation of the nerve force, while the latter appears simply conducting or transmitting in its function. Still more strikingly you see the elementary cells of the secretory structure, in one place united in such form as to present a single follicle; in another a tubule, and in another a lobule of a conglomerate gland. And every variation thus in the minute anatomy or histology of any primary structure, indicates a corresponding modification of its function.

To make the foregoing brief analysis more easily understood, we will place it in tabular form on the blackboard before you, as follows:

COMPOSITION OF THE BODY.

- Fluids.
  - Blood
    - Nutritive Constituents.
      - Albumen.
      - White Corpuscles.
      - Fatty Matter.
      - Salts and Oxygen.
    - Formative . . . . . Red Corpuscles.
    - Excrementitious . . Fibrin. Extractive Matter. Salts and Carbonic Acid.
  - Secretions.
    - Used in the System.
      - Saliva.
      - Gastric Juice.
      - Pancreatic Fluid, etc.
    - Partly Retained and Excretory — Bile
    - Excrementitious.
      - Cutaneous.
      - Pulmonary.
      - Renal Secretions, &c.
- Solids. . Resolvable into Five Elementary Structures.
  - Nervous.
  - Muscular.
  - Secretory.
  - Capillary Vascular.
  - Fibrous.

Elementary Properties and Functions.

Properties Common to all Organized Living Matter, Therefore Elementary . . . . . Susceptibility. Vital Affinity.

Functions Peculiar to Each Structure; Therefore Elementary.

- Sensibility . . . Transmissibility . — Nervous Structure.
- Contractility . . — Muscular.
- Secretion . . . . — Secretory.
- Movement of Fluids with Exudation and Imbibition — Capillary Vascular.
- Elasticity . . . . — Fibrous.

In these two tables you are enabled to see at a glance the primary composition, properties and functions of the human body. Reflect upon

them, gentlemen, until each of them is clearly appreciated and fully impressed upon the mind.

That which will be most difficult for you to appreciate, and trace accurately in the study of the more complex structures and functions, is the difference between the susceptibility as an elementary property of all living matter and the elementary function peculiar to nerve matter called sensibility. If you remember, however, that the first is a passive quality or endowment of each and every atom of living matter, imparting the capacity to be acted upon by various agents; while the other involves both a special structure and a positive local action, you will not be likely to confound them with each other. For instance, a muscular fibre made up of a peculiar arrangement of atoms or cells and endowed with the property susceptibility, receiving a current of electricity or a nervous impression from either a mental or organic nervous centre, performs its peculiar function by contracting. But if the muscular fibre be first washed with a solution of carbonic or hydrocyanic acid by which its susceptibility is destroyed, neither electricity nor nervous force will elicit from it the slightest action. The same is illustrated in the processes of secretion, nutrition, etc. If the secreting cell is endowed with its proper susceptibility and the blood containing the proper elements is brought in contact with it, an active process takes place by which a new fluid is evolved, called a secretion. The vaso-motor nervous force, by altering the action of the blood-vessels and consequently the supply of blood, may modify secretion, but does not either produce or suppress it. The exhibition of nervous force requires a special apparatus or anatomical structure; while the results of susceptibility and vital affinity are seen wherever there is a cell or atom of living matter whether animal or vegetable.

It is the possession of these properties that distinguishes living organic matter from dead matter. If you ask, from whence are they derived, I answer that so far as reliable observation has yet reached, they are derived with the germ from the parent, and in no other way. They are neither material agents, nor active organic forces, but simply properties of living matter, by which such matter becomes susceptible to the influence of external agents, on the one hand; and specific direction is given to whatever molecular changes take place, on the other.

If you now fix your attention upon the tabular statements on the blackboard, and get clearly delineated in the mind the human body, composed of the several elementary structures, each with its own peculiar arrangement of organic atoms, possessed of its elementary properties, and pervaded by the fluids in their normal proportion and composition, you will have an adequate idea of health as applied to the animal organization in a passive condition. But to make the picture complete and capable of practical application another element must be considered, namely, the action of exterior agents. Organized bodies, like all other ponderable matter, are inert or passive until acted upon or brought in contact with certain exterior agents or influences. The vegetable germ may be complete in its organization and its germinal cell endowed with the necessary properties, but until it receives the exterior impression of heat and moisture, it will exhibit no sign of activity or life. So the human body may have every structure complete in the arrangement of its atoms; the fluids may be perfect in their quantity and quality, and the whole may be possessed of the required susceptibility and vital affinity, yet no action or sign of life will be seen until the application of an external force or influence, such as atmospheric air containing oxygen, heat and electricity. Three things, then, are essential to constitute what we term health; namely, an exact

formation and arrangement of atoms or cells constituting the several structures of the human body, the proper quantity and composition of the fluids, and the presence in due quantity and quality of the external agents just alluded to. When all these exist in their normal relations to each other, the phenomena of life are manifested in a strictly normal or healthy manner.

By these remarks, gentlemen, you will perceive that to gain the first or preliminary step necessary to the philosophical study of disease, you need to be perfectly familiar with the departments of anatomy, physiology, chemistry and physics, in their most complete development.

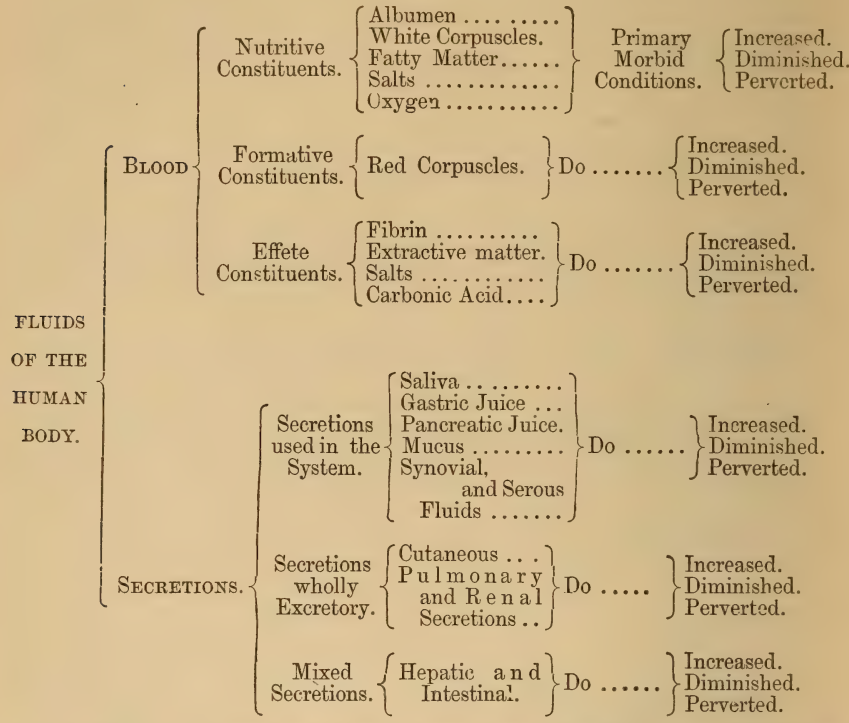
LECTURE II.

Analysis of Disease---Its Elementary Forms---Changes in the Blood---Changes in the Organized Tissues---Functional and Structural Disease---Tabular Statement---Why all Attempts to Build up Systems or Theories of Medicine Founded on Some Supposed Universal Principle of Morbid Action, have Failed.

GENTLEMEN: Having in the preceding lecture subjected the human body to an analytical examination, and pointed out the elementary items which, aggregated, constitute what we term *health*, you are prepared, by following out the analysis, to appreciate the elementary forms and conditions of morbid action constituting disease. If disease is simply a deviation from the natural or healthy condition of some part of the human system, we inquire first as to the directions in which such deviations are possible. Reflection and clinical observation alike show us that deviations from the normal standard may take place in three directions, namely: increase, diminution, and perversion. If we give our attention, first, to the fluids of the body, we find the blood capable of being increased in quantity so as to cause over-fullness of the vascular system, constituting what pathologists term plethora. In other cases it is diminished in quantity so far below the natural standard as to leave the vascular apparatus without the proper distension, which constitutes anæmia. In still another class of cases the blood may be neither increased nor diminished in quantity, but its proximate elements may be altered in their relative proportion, or in their quality, or by the intermixture of some foreign substance, which several conditions may be included under the general term perverted. If we turn our attention from the blood as a whole, to its several constituents, we find each capable of undergoing the same deviations from the standard of health. Either one or all of the nutritive and formative constituents may be increased, constituting a hyperæmic or hyperplastic condition; or they may be diminished, constituting spanæmia, or poor blood; or their properties may be so altered as to constitute septicæmia, or blood degeneration. The latter, however, is much more frequently induced by either excess or alteration of the effete constituents of the blood. When some deleterious agent is introduced into the blood, capable of altering its properties, the condition is called toxæmia.

If we pass to an examination of the secretions, we shall find them all capable of undergoing the same primary deviations from the normal or

healthy standard. That is, each is capable of being simply increased above the normal quantity, or diminished below it, or perverted either by alteration in the relative proportion of its constituents or by the introduction into it of some foreign ingredient. The urine, for example, may be excessive constituting diabetes insipidus; or it may be diminished as in the inflammations; or it may contain less or more than the normal quantity of urea, uric acid, and salts, or it may contain new ingredients as albumen, sugar, &c. The same is true of the cutaneous, gastric, salivary, and all other secretions. Perhaps it will aid you if we place on the blackboard the following tabular summary:



In making this tabular sketch, I have not included in each division all the particular secretions that belong to it, but the most important, which will be sufficient to clearly indicate the morbid deviations, we are endeavoring to point out, and their applicability to each and all the fluids of the human body.

If we turn our attention to the solids or organized structures of the body, we shall find them capable of presenting similar deviations from the healthy condition, either in their properties, their functions or their structure.

For instance, the elementary properties common to all the tissues may be increased or diminished or perverted. In speaking of these properties, susceptibility and vital affinity, as capable of increase and diminution, I do not wish to convey the idea that they are separate substances, to be increased or diminished in quantity or bulk, as we would the quantity of air or water or any other material substance. I simply mean that the structures endowed with these properties are capable of being so influenced as to manifest them

in a greater or less degree of activity, or in some unusual direction. We see one person who either from hereditary or acquired influence, has become so easily affected by ordinary external impressions, that the slightest atmospheric changes are liable to produce exaggerated effects. His susceptibility is too great. Another presents directly the opposite. Neither atmospheric changes nor other excitants produce the ordinary influence, and we say his susceptibility is impaired.

Again, we find one person with rich blood, active atomic or molecular changes, and not only active nutrition, secretion and calorification, but the slightest exudation into any of the structures or upon the membranous surfaces, is rapidly organized into new tissue, causing indurations, adhesions or increased growths. In such the play of vital affinity is manifestly increased above the normal standard. In surgical phrase, he has a hyperplastic diathesis. In another person we may find the reverse of all this. The ordinary organic changes are slow ; nutrition, secretion, and calorification are but feebly maintained ; and if exuditions take place, instead of rapid organization and acquisition of vitality, they degenerate, causing softening of tissue, diffuse suppuration, and diminished nutrition or growth. It is plain that in such we have impaired or feeble vital affinity, and pathologists style it an aplastic diathesis. In still another case or class of cases, we find the molecular changes not merely increased or diminished, but so altered that atoms are attracted to and retained in tissues where they do not naturally belong, causing metamorphosis of tissue as when cartilage becomes bone, muscular fibre fatty tissue, &c. Or still further, causing the primary atoms or cells to be formed erroneously and to accumulate in the form of tumors or morbid growths. These are evidently all results of a perverted vital affinity. The several alterations in the elementary properties, constituting primary morbid conditions, may take place in all the tissues and organs at once, constituting a general morbid condition of the whole system ; or they may occur in only one tissue or organ constituting local predispositions and derangements. If the deviation is general and derived from hereditary influences, or acquired from causes acting feebly but continuously through a long period of time, the individual will present some one of those conditions called diatheses or predispositions, such as the plastic and aplastic, scrofulous, cancerous, rheumatic, gouty, &c. But if the causes act with more suddenness and intensity, producing more abrupt and exaggerated disturbance of the properties, there will result some one of the more acute forms of disease, such as fever, inflammation, or active irritation.

Primary Alterations of Function.—The fact that the natural or healthy performance of any function depends on the coincidence of three things, namely: the proper arrangement of atoms constituting normal structure, the endowment of the structure with the properties in their normal degree, and the presence of the proper stimulus in the normal proportion, it follows that the failure or disturbance of either of these conditions must be followed by corresponding failure or disturbance of function. And as I have just stated, that either or both of the elementary properties are capable of being increased, diminished or perverted, so we may have the same primary deviation from the natural condition in any one or all of the functions in the human body. The function of the secreting structure is to separate from the blood certain materials in a fluid form, called a secretion. The secreting cells of the kidneys, for example, elaborate urine. And few things are more familiar than the fact that the quantity secreted in a given time may be excessive or deficient, or it may be altered in quality—perverted, either by the omission of one or more of its

natural constituents, or by the intermixture with it of foreign substances, as albumen, sugar, coloring matter of bile, etc. The special functions of the nervous structure are sensibility and transmissibility. And there are but few morbid phenomena more familiar to the physician than increased sensibility, technically called hyperæsthesia, and diminished sensibility, called anæsthesia, and many cases are presented in which the sensibility is altered in such a way as to convey an impression of a morbid character, such as heat and cold when there is no real change of temperature; or a sapid substance tastes bitter, or a bitter one sweet. These constitute perverted sensibility. These familiar illustrations are sufficient to show you that each function of the human system is capable of being altered from the standard of health in three directions, namely: increased above, diminished below, and perverted. Hence, we may express the primary morbid conditions of the organized tissues in tabular form as follows:

ELEMENTARY FORMS OF DISEASE

- Elementary Properties.
  - Susceptibility: Increased. / Diminished.
  - Vital Affinity..: Increased. / Diminished. / Perverted.
- Elementary Functions.
  - Sensibility and Transmissibility: Increased. / Diminished. / Perverted.
  - Contractility...: Increased. / Diminished. / Perverted.
  - Secretion.....: Increased. / Diminished. / Perverted.
  - Capillary Transfer of Fluids, Etc.....: Increased. / Diminished.
  - Elasticity.....: Increased. / Diminished.

Primary Alterations in Structure.—The same analytical mode of investigation applied to the study of structural changes, will show them capable of being resolved into three classes, namely: one in which vital affinity being active and the supply of nutritive material abundant, the addition of new atoms, constituting nutrition, exceeds that of disintegration, and hence there is an increased growth, a hypertrophy. Another, in which either the vital affinity is diminished, or the supply of nutritive material is deficient, and in consequence the nutrition is less than natural, constituting atrophy. While the third class embraces those cases in which the vital affinity is perverted or altered in such a way as to cause the attraction and accumulation of atoms not belonging to the particular structure affected. This necessarily results either in the transformation of the structure, as in the conversion of muscular fibre into fatty matter, cartilage into bone, etc., or in some one of the morbid growths, or tumors. These latter may be osseous, fibrous, fibro-cartilaginous, cartilaginous, fatty, or malignant.

From this rapid review, you perceive clearly that we may have regular deviations from the standard of health, either in the direction of excess, diminution, or perversion, in all the elements that go to make up the animal economy: in the blood, as a whole, and in the several constituents separately; in the secretions; in the properties common to all the tissues; and in the functions peculiar to each structure. To complete the review, we may apply the same rule to those natural excitors that act habitually upon the living organization from without, they being capable of acting in excess, or deficiency, or with properties so altered as to make impressions different from simple excess or its opposite, and hence termed perverted. And here, gentlemen, at this early period in your course, you can readily see why every attempt to build up a system of medicine, founded on the idea that all disease is a unit, or traceable to some one theory of morbid action, has failed in the past, and will continue to fail in the future. It matters not whether we take the theory of Brown, which refers all disease primarily to either direct or indirect *debility;* that of Rush, Broussais, and Paine, which traces all morbid action to primary *irritation* or excitement; or that of Hoffman modified by Cullen, which refers all morbid action to a primary morbid impression on the nervous system, they all fail to recognize the fact that, disease being a simple deviation from health, must present as many different aspects as there are directions in which deviations can take place. Almost all theories and systems contain some truth. Their authors and supporters seeing clearly, perhaps, a single mode of morbid action, and looking at this from one standpoint, they endeavor to make all the facts of science and the observations of clinical experience conform to the one central idea or theory. With them the one clearly perceived mode of morbid action is applied to all diseases, either directly or indirectly, and hence in their minds it assumes the place of the fabled iron bedstead, to which all else must be made to fit.

Equally futile and transitory have been all the so-called systems of therapeutics, founded as they usually have been, upon some preconceived theory of disease. Thus the direct and indirect debility of Brown necessitated the predominant therapeutic law of stimulation so generally adopted by his followers; the irritation of the school of Rush, as certainly gave rise to the therapeutic law of depletion, while the restriction of the irritation primarily to the nervous system, by Hoffman and Cullen, only added to the general law of depletion, the use of anodynes and antispasmodics. The analytical review I here give you concerning the elementary forms of disease, or primary modes of morbid action, will enable you to see distinctly just how far any one or all of the special theories of disease and accompanying laws of cure are true,and where they deviate into error. By that review it was made obvious that both the properties of the living tissues, the functions of particular organs, and the molecular or atomic, changes were capable of being so far increased above the normal standard as to constitute disease of excitement, and therefore requiring an application of the therapeutic law of depletion or sedation. It was made equally obvious that these same properties, functions and molecular changes, might be so far diminished as to constitute disease of debility, requiring the application of a law of stimulation, or active support.

And, again, it was seen that the properties of the blood and tissues were capable of such alteration as would cause perverted actions, both in the molecular changes in the tissues and the functions of particular organs, thereby requiring neither simple sedation or stimulation, but alterants, antidotes, and eliminants. You thus see that all these theories are correct when the application of each is restricted to a single mode of morbid action;

but they become erroneous and highly mischievous the moment the attempt is made to apply any one of them to *all* morbid action.

The foregoing observations apply equally well to all the various pathys and isms that have from time to time sprung up like mushrooms from the fertile soil of medical science. Whether you take the bluntly expressed maxims of Samuel Thompson, the founder of Thompsonianism and its modification known as modern Eclecticism, that "heat is life and cold is death," or the more fanciful dogmas of Hahnemann, that "like cures like," and the "smaller the dose the greater the therapeutic power," they are equally vain attempts to make the varied and often opposite phenomena of disease subservient to a single partial law.

By these observations, I wish to impress strongly upon your minds the important fact, that the only true basis or starting point for a rational study of disease, is afforded by a thorough knowledge of the anatomy and physiology of the human body. Once possessed of a full knowledge of the composition, properties and functions of the human system, we are prepared to appreciate each deviation, in any direction, from the natural condition so far as to constitute disease. With such a preparation, you are ready to receive, arrange, and apply the facts and observations of clinical experience.

Instead of espousing some theoretical dogma and vainly striving to adjust all the facts of science and observation to it, or bewildering yourselves with cumbersome systems of nosology, you carefully study the causes and phenomena of disease from the standpoint of health, with a view to remove or mitigate the first, and to modify the second in the direction towards its primary point of departure, in other words towards the re-establishment of health. That is, if you find the phenomena or symptoms of disease indicating increased activity or irritation, you strive to reduce or subdue the excess of activity; if indicating depression or impairment of activity and excitement, you endeavor to prop up or sustain; if indicating neither simple excitement nor depression, but perversion of action, you call to the aid of your patient such alteratives as are best adapted to correct the particular perversion; and if by continuance of morbid actions, obstructions or exudations have occurred, either in the blood or the tissues, you call into requisition such eliminants, alteratives, and tonics as will be most efficient in promoting their removal.

By such a course you become philosophical practitioners of the healing art, true handmaids of nature, ever studying the nature and tendencies of her embarrassments, and ever striving to aid in correcting them.

LECTURE III.

General Processes and Complex Functions—Their Relations to Each Other in Health and Disease---What Constitutes Nature---The Efforts of Nature---The "Vis Medicatrix Naturæ"

IN the two preceding lectures I have endeavored to present to you an analytical view of the elementary structures, properties, and functions of the human system in their natural relations, constituting health; and the various deviations from that natural relation constituting the primary forms of morbid action or disease. Your attention is now invited to a consideration of certain general processes and complex functions, which result from the anatomical and functional union of the various elementary structures to which I have alluded. These processes differ from functions, inasmuch as they are not the result of the action of any one or more of the structures, but are constantly going on in all the structures at once. They may be termed nutrition, disintegration, and calorification. By the first is meant the direct addition of new atoms to the organized structures; by the second, the removal of the old atoms as they become useless or superfluous; and by the third, the evolution of heat to maintain the temperature of the body. These complex functions are performed by four groups of organs, which may be designated the digestive, the excretory, the reproductive and the mental. The first embraces the alimentary canal and its appendages, by which the new material is received, digested, and assimilated, or prepared for use in the process of nutrition. The second embraces all those organs and structures engaged in the work of receiving the products of disintegration and removing them from the system, of which the skin, kidneys and lungs are the chief. The third, consists of the male and female organs of generation. And the fourth is made up of the cerebro-spinal nervous apparatus, including the special senses and the muscles of voluntary motion.

In regard to the general processes, it may be remarked that the two first named are directly antagonistic, or the reverse of each other. Nutrition, which consists in the addition of the new material, derived from the digestive and assimilative organs, directly to the respective tissues for which it has been fitted, is undoubtedly performed in obedience to the attraction or affinity of each tissue for the appropriate atoms or cells; these latter passing through the walls of the capillaries by a process which has been likened to that of exosmose. The escape of the nutritive material from the blood in the capillary vessels and its lodgment in the several tissues, differs, however, from the simple physical process termed exosmose, inasmuch as only such atoms escape from the vessels into each tissue as are prepared to become a part of it, although they are all in one mass in the blood.

This fact alone, shows that there is in the living structures of the body some inherent power of selection, which I have thought best to term affinity, or vital affinity.

As the capillary vessels have no open ends or visible termini, but are continuous tubes between the arterioles and veinous radicles, it is not easy to explain how the nutritive matter passes from the blood in the vessels, into the adjacent structures. But it is highly probable that the walls of the capillary vessels have pores, through which the primary atoms of matter may pass, either from within or without.

You thus see the admirable adaptation of the true capillaries, both as connecting links between the arterial and veinous systems of vessels, and as the medium through which matter is conveyed to and from all the other structures of the body in the processes of nutrition and disintegration. When the matter furnished through the digestive organs is perfect in its assimilation, the vascular system unobstructed, and the vital affinity of the tissues natural, the process of nutrition goes on healthily and the integrity of each part is maintained. During the period of development or growth, the process of nutrition predominates over that of disintegration and excretion. After maturity and through the active period of adult life, these two processes should balance each other. But after passing the last named period, disintegration begins to gain supremacy over the nutrition and generally holds it in increasing ratio until death by old age.

The conditions essential to healthy nutrition, are the presence of a sufficient quantity and variety of perfectly assimilated material, in arterialized or oxygenated blood passing with a certain rate of motion through the capillaries ; and the existence in the structure, of the natural properties, susceptibility and vital affinity. If the quantity or variety of food be insufficient, or if the digestive apparatus be incapable of perfecting its assimilation, nutrition will be retarded, causing loss of flesh or atrophy of tissue ; and if this is carried beyond a given point it will constitute disease. But if the quantity and quality of food and its assimilation, are both natural and complete, yet if the properties of the tissues are altered from the natural standard, nutrition will be altered in the same direction. If these properties are impaired the attraction of new atoms will be diminished, causing either atrophy or softening of structure, or both, as you will bye-and-bye see in the low forms of fever. If the properties are increased they will cause too rapid an addition of new material, and unless the disintegration be hastened correspondingly, an increased growth or hypertrophy will be the result. If the properties of the tissues are neither depressed or exalted, but by the presence of some disturbing agent, are perverted, it will result in the attraction and lodgment of atoms in tissues where such atoms do not naturally belong, thereby causing the formation of aplastic, caco-plastic, or plastic deposits, constituting either transformation of structures, deposits, or morbid growths, as explained in the preceding lecture.

The process of disintegration consists essentially in the displacement of such atoms as have become useless or superfluous in the several structures, and their return through the capillary walls into the mass of the blood, constituting what I have already pointed out to you as the effete constituents of that fluid.

The conditions essential for the healthy performance of this process, appear to be the presence of the proper proportion of oxygen in the blood of the systemic capillaries; the normal rate of motion of the blood through these vessels; and the natural condition of the elementary properties. The presence of a due proportion of oxygen is probably as essential to healthy disintegration, as is the proper supply of perfectly assimilated material for the process of nutrition. The effete matter resulting from the waste of tissues and returned into the blood, is separated therefrom and cast out of the sytem through the agency of several important organs, each separating a particular class of ingredients, and thereby holding an intimate and important relation to each other. The principal organs engaged in this work are the skin, lungs, liver, and kidneys. Their relation to the process of disintegration, is as intimate and important as is that of the digestive organs to nutrition. The functions of the skin and kidneys are wholly ex-

cretory, their secretions consisting chiefly of the saline and nitrogenous products of disintegration. The functions of the lungs and liver are, in one sense, more complex. While the first give exit to a large part of the carbonaceous products of disintegration, with aqueous vapor and a small amount of animal matter; it also receives the oxygen which is to be supplied through the blood to the whole system. So, too, the liver not only separates from the blood the products of disintegration in the form of cholesterin and coloring matter which are effete and disappear through the alimentary canal; but also, certain alkaline constituents that are not effete, and which are used in aiding the process of digestion. So important are the functions performed by these several excretory organs, that no one of them can be entirely suppressed, even for a brief period, without endangering the life of the whole. Yet so carefully has the author of nature guarded against such emergencies, that whenever the function of one of these organs is diminished, another, by increased activity, may in part, at least, supply the deficiency. This close sympathetic relation of one organ with another, is most easily seen in the functional relations of the skin and kidneys. Probably none of you have failed to notice the fact, that when the skin is unusually active, as in the warm dry air of summer, the quantity of urine voided in a given time is much less; and when it is diminished by the cold and damp atmosphere of spring and autumn, the quantity of urine is proportionately increased.

Now, so long as these organs maintain this active sympathy and mutually compensating action, in any individual, he may freely expose himself to sudden and extreme atmospheric changes without harm. But let this active sympathy fail, and the very first exposure to marked atmospheric vicissitudes will be likely to result in the development of the phenomena of disease.

A similar, though less marked, sympathetic relation exists between the excretory functions of the lungs and liver. The four important organs or structures under consideration, are not merely the principal sewers, if I may so speak, through which the products of disintegration and waste are conveyed out of the system, but they are equally the active agents for separating from the blood, and turning out of the body, all such foreign and disturbing material as may have entered it from without, so far as it may be capable of separation.

The idea so long popular, both in and out of the profession, that the blood and tissues could be purified from the presence of offending and poisonous material, by acting directly on the stomach and bowels by emetics and cathartics, is erroneous.

It is, indeed, an error that in times past, led to great abuses in the use of such evacuants in the treatment of disease; and from which the non-professional part of the community have not yet been wholly freed. Before leaving altogether the subjects of nutrition and disintegration, I must guard you against another error, which the student is apt to espouse from a perusal of much of our current medical literature. I allude to the doctrine, inculcated by many writers, that to retard the process of disintegration by which old atoms are removed from the tissues, is equivalent to the addition of an equal amount of new atoms by nutrition. Hence, those agents, like alcohol, which by their presence in the blood are capable of so altering the vital affinity of the tissues as to retard disintegration, are styled by them *indirect* food. And we are gravely told that if a laboring man, by taking a certain quantity of alcoholic drink, diminishes the gross amount of the excretory products of disintegration to the extent of half a pound in the twenty-four hours, it is equivalent to the addition of that

amount of new matter through the organs of digestion and the process of nutrition.

If it is true that a primary atom or cell of organized animal matter, once in its place as a part of a living structure, is capable of performing its office for an indefinite period, or so long as it can be retained in its position, then indeed retarded disintegration is equivalent to additional nutrition. And it will only be necessary to find some agent capable of arresting the process of disintegration altogether, and we may live on indefinitely without further expense for food, or further loss of time in eating it. Unfortunately for this theory, however, there is no more imperative physiological law, or one more prominently inscribed on all living animal matter, than that active life and molecular changes are inseparable. When the germinal matter or bioplasm stored in the dormant germ, once receives the impression of its appropriate stimulus, and the active phenomena of life have begun, there has commenced coincidently those molecular changes constituting nutrition and disintegration. And throughout the whole kingdom of animal life, you will find the activity of these changes to bear a direct ratio to the activity of the phenomena of life. Hence to retard these changes is to retard or diminish the phenomena of life. And the agents that are capable of retarding disintegration, instead of being called *indirect food*, should be classed as organic sedatives, and used only as medicines where such sedatives are needed.

To counteract the ordinary waste of tissues by retarding disintegration, instead of furnishing new material by nutrition, is much like retaining the limbs of a tree after they have become dead and dry. It may indeed serve to retain fullness or bulk, but only to embarrass instead of to sustain the processes of life.

And at the bed-side of the sick you cannot be too careful in discriminating between those cases of failure in flesh from deficient assimilation and nutrition, and those from excess of disintegration. The former are common, and the latter rare.

Beside the general processes of nutrition and disintegration, I named a third, which was called colorification, by which is meant the evolution of heat sufficient to preserve the natural temperature of the human body. All classes, genera, species and varieties of living animals present a temperature peculiar to themselves, and generally differing more or less from the temperature of the medium in which they live.

This results from the evolution of free heat by the changes in the condition of matter, constantly taking place in the tissues of living animal bodies. It is a well known law in physics that whenever matter passes from a rarer to a denser condition, latent heat is set free and becomes sensible; and when matter passes from a denser to a rarer state, free heat is absorbed, or becomes latent. If you have studied properly the changes in matter produced by the reception and assimilation of food, and other ingesta, and its appropriation to the several tissues, you readily see that the general result of these functions and processes, is to change the matter after fairly entering into the system from a rarer to a denser state, thereby tending to increase the temperature by increasing the amount of free heat. On the other hand, the changes in matter resulting from disintegration and excretion as a whole, are of the opposite character, and consequently result in a tendency to diminish the temperature by converting free into latent heat. In the natural or healthy condition of the human system, these opposing processes and functions bear such a relation to each other in regard to the evolution and absorption of heat as to maintain the average temperature of the body at 55° C. (78.6° F.) It is neither neces-

sary nor proper, at this time, to refer to the former theories in regard to animal temperature.

For many years after organic and animal chemistry had begun to attract attention, the evolution of heat in the system was attributed to the direct union of the oxygen and carbon in the lungs, constituting a species of combustion. And several ingenious theories were invented for explaining its diffusion so equally through the whole system, from the seat of combustion in the lungs. The discovery of the fact that the oxygen was absorbed from the air cells of the lungs and was carried with the arterial blood, and that the carbonic acid gas evolved through the lungs, was not formed in those organs, but brought in the veinous blood from the systemic capillaries, destroyed all the preceding theories. It did not, however, destroy the idea of combustion by the union of oxygen with carbonaceous matter. It simply transferred the place of the union from the lungs to the systemic capillaries, where Prof. Liebig and his co-laborers of the chemico-physiological school of investigators, still retain it. And not only so, but they divide the food into nitrogenous and carbonaceous, and represent the former as designed to nourish the tissues, and the latter to unite with oxygen and form carbonic acid gas to be evolved through the lungs, and heat to maintain the proper temperature of the body. It is in accordance with this theory that you find in nearly all your books the carbonaceous elements of our ingesta, styled respiratory food. More than twenty years since, I met with so many facts connected with the diet of individuals and communities, and also with the phenomena of diseases, which seemed difficult of explanation without denying the correctness of the theory under consideration, that I instituted during the years 1849 and 1850, several series of experiments and observations, designed to determine positively the relations of certain articles or constituents of food and drink to the evolution of heat in the human system. The details of many of these investigations, with the results or inferences to be deduced from them, were embodied in a paper read to the American Medical Association, at its annual meeting in Charleston, South Carolina, in May, 1851; and subsequently published in the North-Western Medical and Surgical Journal, then published in this city.* The results of those investigations, together with much subsequent observation relating to the same subject, satisfied me that there was no direct relation between the kind of food taken and the amount of heat evolved; and consequently no foundation for calling carbonaceous matter respiratory food, more than any other matter capable of assimilation. On the contrary, a large number of carefully recorded observations of the temperature of a healthy individual, first, under an ordinary mixed diet; second, under a diet exclusively carbonaceous; and third, under a diet exclusively nitrogenous, showed that the temperature of the body uniformly increased during the active processes of digestion and nutrition, and decreased as these declined. The lowest temperature was before breakfast in the morning, after the long fast of the night. After breakfast it increased steadily for two or three hours, and attained about 1° C. (1.8° F.) above the temperature of the early morning.

By 1 o'clock, p. m., it had generally receded again about 0.4° C. or from half to three-quarters of a degree F. If dinner was then taken, in half an hour it was perceptibly increasing and continued to do so for the next three hours, reaching its climax about the middle of the afternoon, when it would be from 1.1° to 1.4° C. (2° to 2.5° F.) higher than in the early

*See Experimental Inquiries, etc., in the North-Western Med and Surg. Journal, Vol. IV, page 196, 1851, by N. S. Davis.

morning. From that time it declined very slowly until the usual time for a light supper, after which it again increased moderately for two or three hours. These observations fully established the fact that the temperature of the body does not depend on kind or quality of the food, but directly on the activity of the processes of assimilation and nutrition. Indeed, it appeared that when the individual was restricted for three days to a diet exclusively carbonaceous, the average temperature was slightly less than during confinement for a similar period to a diet exclusively nitrogenous. It was further ascertained that some of those articles which have been represented as pre-eminently respiratory food, alcohol for example, when taken into the system, induced a positive reduction of the temperature below the natural standard. While the changes in matter taking place during the active processes of digestion, assimilation and nutrition, cause the evolution of heat tending to increase the temperature of the body, the processes of disintegration and excretion produce the opposite effect.

More especially is this true of those excretions that pass through the skin and lungs. In the natural condition of the system, these pass off principally in the form of gases and aqueous vapor. If you remember the large amount of free heat rendered latent by the conversion of fluids, and especially water, into vapor; and that this process is constantly taking place from the whole cutaneous and pulmonary surfaces, you will not fail to appreciate the actively cooling effect upon the temperature of the whole body by such process. In view of the teachings of the past, and of the language of many of the books you study at present, it may sound to you strangely, when I speak of respiration as a cooling process. Yet that it is so, is not only apparent from the well-known fact that the fluid constantly bathing the extensive mucous membrane lining the whole extent of the respiratory passages is being constantly converted into vapor and being exhaled; but also from the additional fact that both man and the lower orders of animals instinctively increase the frequency of respiration when too warm, and diminish it when too cold. And purely instinctive movements are believed to be always in harmony with physiological laws. Have you noted, gentlemen, your own habits in regard to this subject? While sitting here in a warm room, you breathe freely from fourteen to eighteen times per minute. But when the lecture is ended and you pass out on a cold winter day, do you continue the same rate of breathing, or do you almost unconsciously shrug your shoulders, draw your overcoats around you, and so far stifle your respirations that they will not average ten per minute? Again, look at the dog on your door-step on a hot summer day. His mouth is open, his tongue out, and he is breathing as fast as he can. But you never saw him do the same thing on a cold day, unless in immediate connection with excessive exercise. And many an ox has been whipped for endeavoring to cool himself on a hot day by putting out his tongue and breathing fast, or "lolling," as his unlearned driver would call it.

The same indications are afforded by the natural variations in the cutaneous function. When the surrounding atmosphere is warm, tending to accumulate heat in the body, the skin relaxes and the conversion of the cutaneous fluid into vapor increases. In other words, perspiration is increased. When the surrounding atmosphere is cold, just the opposite effect on the function of the skin is induced.

So also in diseased or morbid states, when the excretory function of the lungs, skin and kidneys is diminished, the temperature of the body increases; not because there is a more rapid evolution of heat, but simply on

account of the diminution of those processes or functions by which the free heat is rendered latent and conveyed away.

You cannot study too carefully the topics presented in this and the preceding lectures. To comprehend clearly the primary tissues, endowed with their elementary properties; the primary functions each perform; and trace their combination to form more complex organs, and groups of organs, each working for the accomplishment of a given purpose, yet each bearing such relation to the others that a disturbance of the function of one involves directly or indirectly the functions of all the rest, is the only way to gain any clear conception of what is meant by *nature*, as used in medical parlance. From the days of Hippocrates to the present time, this word "nature" has occupied a prominent place in the literature of our profession. In all ages, it has been clothed with the attributes of intelligent personality, and sometimes almost those of deity. Hence the expressions, "the powers of nature," the "efforts of nature," the "*vis medicatrix naturæ*," etc. We are told that *nature* does this and that, at almost every turn, and yet very few have attempted to explain what they meant by nature. One who in our time has written much in eulogy of *nature*, and her power to heal disease, and has correspondingly endeavored to belittle the value of art, defines his favorite goddess thus: "Nature, in medical language, means a trust in the reactions of the living system against ordinary normal impressions."*

According to this definition, nature is not a physical power or function, but a simple mental act—an exercise of faith or trust. Comment on such a definition is unnecessary. But suppose the author of this definition meant that nature consisted, not in the mental act of trust or faith, but in the "*reactions* of the living system against ordinary normal impressions," the question would then arise, what are these *reactions?* If they are anything more than shadows of the imagintion; and if the phrase, "reactions of the living system against ordinary normal impressions," means anything more than a rhetorical display of words to cover ignorance, such reactions must consist of nothing more than the actions induced in the various structures and organs by the impression of ordinary exterior agents, as food, air, light, etc. The impression of food upon the digestive apparatus, excites activity in certain secretory and muscular structures by which such food is both dissolved and moved onward, until its ingredients are fitted for addition to the tissues.

The presence of such prepared material in the blood makes a normal impression on the properties of the tissues and the resulting *action* constitutes nutrition or the active addition of the newly prepared material to the structures. So the impression of oxygen in the arterial blood of the systemic capillaries, on the same properties of the different structures causes the *action*, or *reactions* if you prefer, constituting disintegration. So, too, the same agent, reaching through the same medium, the various nervous centers by its normal impression on the properties of the nerve structure, causes that action which is styled nerve-force or innervation. The presence of the materials for constituting urine in the blood, making a normal impression on the properties of the secreting cells of the kidneys causes such action as actively combines these materials into urine and passes it out of the system.

So of all the other secreting organs. But let us go a step further, and we shall find that the various tissues and organs are not only capable of acting or *reacting* against ordinary normal impressions, but also against

*Oliver Wendell Holmes.

many impressions of an abnormal character. As I have already said, agents may enter the blood with the ingesta, either through the digestive or respiratory organs, which are not capable of being used in nutrition or in the natural process of disintegration, but which are capable of making an abnormal impression on the properties of the tissues generally, or on those of some particular organ. And these abnormal impressions cause unnatural actions, either in the whole body (general disease) or in the particular organ for which the agent had a special affinity (local disease.) Hence, Dr. Holmes defines disease to be the "reactions of the living system against abnormal impressions." But every foreign agent that gains access to the tissues through the medium of the blood, and makes an abnormal impression, is not followed by disease. On the contrary, many of these agents bear such a relation to some one of the excreting organs that they are rapidly separated with the proper secretion of such organ, and no morbid action results, thus presenting one of the chief conservative powers of the living body. Indeed, if we put this ability of the different excretory organs and structures to eliminate from the blood such elements as are foreign to its composition, with the power of certain organs to take on increased action in temporary compensation for deficient action in others, we shall have a correct idea of the true *vis medicatrix*, or rather *vis conservatrix naturæ*. If you choose thus to use the word nature, with the definite understanding that it means simply the natural activity of the aggregate structures and organs of the body and their relations to each other, there is no objection to such use. It is a convenient and familiar word, and may be used to express the aggregate activities of a complex living body, as properly as any other in our language. So, too, if when you use the expressions, efforts of nature, powers of nature, *vis medicatrix naturæ*, etc., you simply mean the action of some organ to eliminate morbid material, or to compensate for the deficient action of some other organ or the sedative effect of some retained excretion in overcoming the morbid excitability and muscular spasm that had caused its retention, there is no objection to such use. But when "nature" is installed in the human system as a personal entity, and clothed with attributes of intelligence, and the phenomena of disease represented as the efforts of such nature to resist some morbid impression, and consequently not to be interfered with by art, it becomes not merely a fanciful goddess, but a positive hindrance to the advancement of practical medicine.

LECTURE IV.

What are Medicines—What the Distinctions Between Food and Medicines—Their Classification for Therapeutic Purposes—Etiology.

HAVING, in the preceding lectures endeavored to explain, as familiarly as possible, the nature and conditions of health and disease in the living human body, I must next direct your attention to some thoughts on the nature and *modus operandi* of medicines. Remedial agents and influences properly embrace everything that can be made useful in alleviating or curing disease.

In this sense, an encouraging word or cheerful look, is as much a remedial agent as a pill or powder from the apothecary. It is my intention, however, to limit your attention during the present hour to those material agents ordinarily styled medicines, reserving the consideration of other influences for another occasion. Medicines, in this restricted sense, are such agents as are capable of being introduced into the living system, and exerting a modifying influence over one or more of the properties or functions of the body, without being capable of assimilation or addition as nutritive matter, to any of the tissues. They may be introduced into the system through the digestive organs: through the lungs by inhalation; through the skin by absorption ; through the subcutaneous tissue by hypodermic injections; and by injection directly into the blood vessels. The first is the more common, and practically important method. But in whatever way the medicine is given, it enters the mass of the blood generally unchanged in its composition, and induces its effects by passing with the blood into contact with the various structures of the body, and by such contact modifying either the properties or molecular changes, or both, in one or more of these structures. As a general rule they are also, sooner or later, eliminated from the blood by some of the excretory organs in so nearly the same condition as when they were introduced, that they can be readily detected by the proper chemical tests. The apparent exceptions to these rules are such alkalies and alkaline earths as are capable of uniting directly with, and neutralizing acids, in the stomach before time for absorption.

Even in these cases, however, the resulting compound is absorbed, and after passing the round of the circulation, is eliminated. The real exceptions, are those agents that act directly on the structures to which they are applied, as in the case of sinapisms, blisters, caustics, etc. The disposition on the part of many writers to call all the hydro-carbonaceous substances respiratory food, and those substances that simply retard the process of disintegration, *indirect* food, has caused some confusion in regard to the distinction between food and medicine. It seems to me, however, that there are two plain and essential points of difference between these two classes of substances. The first is, that food proper never passes through the digestive and assimilative organs without important changes in composition and form, and never re-appears in the excretions from either skin, kidneys or lungs, in the same form as it entered the system. For instance, the principal proximate elements of our food are starch, gum, sugar or glucose, fat or oils, gluten, casein, the fibrin and albumen of flesh, and the inorganic salts with which they are united. If you note carefully

the successive changes of the food into chyme, chyle, lacteal fluid, etc., you will find all these proximate elements radically changed before they reach the mass of the arterial blood. And you will seek in vain for any one of them in the eliminations from the true excretory organs of the body. This is directly opposite to what I have represented to be the behavior of medicine in passing through the system.

The second distinction is that food taken in a healthy state of the system always satiates the appetite for the time being; and that, too, in about the same quantity, without regard to the length of time it may have been used. For instance, if a person eats bread three times a day for 20 years, he is just as readily satisfied at the end of the time as he was at the beginning. Natural appetite or hunger is simply the demand for material to supply the waste of tissue, and every substance capable of assimilation when taken will satisfy that demand; and with that satisfaction ceases for the time being all relish for more.

No such effect, however, will follow from the taking of materials that cannot be assimilated and added to the tissues by nutrition. Hence, daily observation shows that all those excitants, like the active principles of tea and coffee, and the anæsthetics or retarders of tissue-disintegration or waste, like alcohol, ether, chloroform, tobacco, etc., which have been classed by some as *indirect* food, have no power to satisfy except by mechanical fullness of the stomach, or by such a degree of stupor or anæsthesia as renders the individual for the time oblivious to further impressions.

And all these articles, instead of producing the same effects in the same quantities for any number of years, as is the case with real food, invariably create a steadily increasing demand for more. You see the young lady who sipped daintily a cup of drink at her breakfast containing a tablespoonful of tea or coffee diluted with milk and water, ten or fifteen years later in life taking two cups at the same meal, each filled, not with milk and water flavored with a tablespoonful of tea, but with a strong infusion of tea or coffee.

In like manner you see the young man at 18 years taking but one cigar and one glass of beer or wine per day, at 30 years consuming five or six cigars and as many drinks of beer, with now and then a glass of distilled spirits; and at 40 years he consumes a dozen cigars a day, and the number of drinks is limited only by the quantity required to induce intoxication. It is true that most, if not all, of these agents, used habitually, induce such a morbid condition of the stomach as to impair or destroy the appetite for proper food, but not for themselves. On the contrary, the latter grows stronger and stronger, more and more insatiable, until it too often becomes the ruling despot of the individual's life. Having thus defined what is meant by medicines as distinguished from food or aliments, I will divide the whole into two great classes, as follows:

First, those substances that are capable, by their presence in the blood, of modifying the properties common to all the tissues, in such a way as to produce a perceptible change in one or more of the general processes taking place in the living body. These may be called general remedies, because in modifying the general processes of nutrition, disintegration, and calorification, they necessarily influence in some degree all the functions of the animal economy.

Second, those substances which, though introduced into the mass of the blood, exhibit an affinity for, or special action on, some particular organ or group of organs, and hence may be termed local remedies.

The remedies included in the first class, may be arranged in four groups, called general stimulants or excitants; general tonics; general sedatives, and general alteratives.

The first group embraces those substances that increase or exalt the susceptibility of the tissues simply—as tea, coffee, heat, oxygen, etc.

The second includes such agents as are capable of increasing the play of vital affinity, either alone or in connection with a moderate increase of susceptibility, thereby giving an increased tonicity to the structures of the body, and generally an increase in the evolution of heat. To this group belong the preparations of iron, the mineral acids, guaiac, cantharides, phosphorus, many of the bitter vegetable alkaloids, etc.

The third group embraces those agents that are capable of influencing either the susceptibility or the vital affinity, or both, in the opposite direction from either of the preceding groups. That is, they either depress the susceptibility or impair the play of vital affinity, or both, at the same time. Consequently they diminish the molecular changes constituting nutrition, disintegration and secretion, and diminish both the evolution of heat and the capacity to receive impressions. To this group belong the hydrocyanic and carbonic acids, the alkalies, the bromides, alcohol, ether, chloroform, etc. Some of you may be surprised to see the alcoholic liquids included among the general sedatives. But all the experiments with alcohol, from the days of Dr. Prout to the present time, have shown that while present in the blood it directly diminishes the temperature of the tissues, retards the atomic changes and the amount of eliminations, and diminishes the general susceptibility. If these effects do not constitute it a general organic sedative, it would be difficult to conceive what should be ranked as such.

The fourth group embraces such agents as are capable of modifying the properties of the tissues in a manner different from that of simple increase or diminution, and hence they are called alteratives. To this group belong iodine, mercury, arsenic, and their several preparations; together with those agents that are supposed to neutralize poisons in the blood, or to prevent what are called zymotic changes in that fluid, such as the sulphites, permanganates, carbolic acid, etc.

These definitions are sufficient to give you a correct idea of what is meant by *general remedies.*

They produce their effects, by acting on those elementary properties that are common to all the structures of the body. When they increase or exalt these properties they are stimulants and tonics. When they impair or depress, they are sedatives. When they modify the properties different from either increase or diminution, they are alteratives.

But much the larger part of the remedies in the works on materia medica, belong to the second class, called local remedies. Quite a number even of those I have enumerated as general remedies will be found to possess, in addition, a direct local influence on some structure or organ. Thus, alcohol, by its presence in the blood, not only retards molecular changes throughout all the tissues as a general remedy, but like all true anæsthetics, it also diminishes locally the sensibility of the cerebro-spinal nervous centers. So, too, the tea and coffee, which have been ranked as general excitants, are capable of exerting a special local influence over certain portions of the nervous system, inducing wakefulness, palpitations, muscular tremors, etc.

The group of remedies usually styled narcotics or soporifics, act more exclusively upon the brain and nervous centers. They directly diminish the sensibility of the nerve structures, and thereby relieve pain and favor sleep. In large doses they are capable of so completely suspending cerebral sensibility as to cause coma and death. To this group belong opium, conium, hyoscyamus, lactuca, chloral, etc. Though all these agents dimin-

ish cerebral sensibility, they do not all act alike. Thus, opium and its preparations cause dilatation of the smaller vessels of the nervous centers, and consequently increased accumulation of blood; while hyoscyamus, belladonna and stramonium, cause contraction of the vessels, and thereby lessen the quantity of blood in the part. The action of the former is accompanied by contraction of the pupil of the eyes, the latter by dilatation. Although the narcotics act primarily on the nervous tissues, yet by diminishing nerve sensibility, they secondarily diminish the influence of the nervous over the muscular structures, and thereby impair the respiratory movements, circulation, the peristaltic motion of the bowels, and to some extent, the action of muscles of voluntary motion.

Another class of agents when introduced into the system are capable of so modifying the circulation and properties in the cutaneous tissue as to cause a marked increase in the amount of exhalation from the surface; and you call them diaphoretics or sudorifics. Another class exert a similar influence on the mucous membrane of the respiratory passages, and you call them expectorants. Another class so influence the kidneys as to increase the quantity of urine secreted in a given time, and they are called diuretics. Still another class so modify the condition of the mucous membrane of the stomach and bowels and quicken the peristaltic motion, as to result in increased gastric and intestinal discharges, and they are called emetics and cathartics. The last four groups of remedies so alter the play of affinity in the organs on which they act as to increase secretory action. But there are remedies acting on the several organs in the opposite direction; that is, in such a manner as to diminish secretion, and they are called astringents. Again, we have remedies of more or less value that do not directly modify either the structure or function of any part of the system, but which exert a purely chemical or mechanical influence. Thus, you may give acids to neutralize an excess of alkalies, either in the stomach or the blood; or alkalies to neutralize an excess of acids. Pepsin, hydrochloric acid, and many other substances, may be used as gastric solvents, when the natural gastric juice is deficient.

There are also remedies of great value that do not properly belong either to the group of general organic sedatives or to the local narcotics. When properly administered they are capable of either diminishing the action of the heart and arteries, or of lessening the excitability of the cerebro-spinal and vaso-motor nervous centers. Those that appear to directly diminish the action of the heart and arteries, as the veratrum viride, aconite, digitalis, cold, and venesection, may be called vascular sedatives. Those that more prominently diminish the excitability of certain portions of the nervous apparatus, as the gelseminum, calabar bean, ergot, cimicifuga, etc., may be styled nervous sedatives.

In thus glancing rapidly over a therapeutic arrangement of remedial agents, it is no part of my purpose to enter upon the discussion of the *modus operandi* of medicine, but simply to give an outline of such a classification as would correspond with the views expressed in the preceding lectures, concerning the nature and varieties of disease. If an accurate knowledge of physiology, or the conditions of function and structure, which constitute health, is essential as a starting point for acquiring a knowledge of disease, so is a thorough study of the nature and *modus operandi* of medicines essential as a preparation for their intelligent application in the treatment of disease. It is to be hoped, therefore, that all of you have given due attention to this branch of medical science during the earlier part of your studies. If not, I cannot too strongly urge upon you the importance of early supplying the deficiency. To note

down formulas or prescriptions and apply them in the treatment of particular diseases, simply because they were recommended by your teachers, without an accurate knowledge of each of their constituents and the special effect it is expected to produce, is to exhibit a blind dependence on authority degrading to the practitioner and dangerous to his patients. The conditions essential for the rational practice of medicine are a clear conception of the morbid conditions affecting the patient, an equally reliable knowledge of the nature and actions of medicines, and the discipline of mind necessary for accurately adjusting the latter to the fulfillment of the indications presented by the former.

Etiology.—The general indications for the employment of remedial agents have been variously classified by different writers. The most simple and convenient arrangement is, to consider first, those having for their object the removal of the cause or causes; second, those arising from the essential pathology of the disease; and third, those afforded by the secondary symptoms or consequences of the primary pathological condition.

There are many morbid conditions which speedily cease by simply removing the causes that have induced them. There are others, which when fairly commenced, continue, though generally with less activity, after the causes have wholly ceased to act. Hence a correct knowledge of the nature and *modus operandi* of the causes capable of giving rise to particular forms of disease is of great importance both to the physician and the community. Such knowledge not only enables the physician to treat individual cases of disease more successfully, but it enables both individuals and communities to adopt such sanitary and hygienic measures, as to greatly lessen the prevalence and fatality of many of the most important diseases to which our race is subject.

Etiology, therefore, affords the only reliable foundation for the sanitary improvement of cities, populous towns, and even rural districts. To this department of medical science the world is indebted for all the advantages it derives from systems of sewerage, scavengering, water supply, modes of ventilation, improved construction of dwellings, etc.

And yet, there is no field in which more careful and patient labor is needed, or which will yield the laborer a richer reward. For though very much has been accomplished in ascertaining the special circumstances which favor the development of many morbid causes, the laws that govern their diffusion, and their influence on the human system, yet but little progress has been made in the work of isolating and studying the nature, composition and properties of the several causes themselves. What has already been accomplished affords a broad foundation for most important sanitary improvements, both of an individual and municipal character, but what remains to be done in this department would add much to this foundation, and still more to our success in endeavoring to remove the causes acting injuriously on our individual patients. Diseases are often produced by the joint action of several causes, some of which act with feeble intensity, but continuously, through considerable periods of time. Others act more abruptly and with greater intensity. The first usually produce their effects slowly, merely modifying slightly the properties of the tissues or the functions of one or more organs, without at once developing the phenomena of active morbid action, and hence are called remote or predisposing causes. The second, acting with more intensity, and more directly developing marked symptoms of disease, are called exciting causes. The division, however, is an artificial one, as nearly all the predisposing causes become direct exciting ones by simply increasing their intensity or prolonging their duration. A more natural division of causes would be into external and internal.

The first, embracing all agents and influences originating exterior to the living body, and capable of making an unnatural impression upon any of its parts; and the second, such as originate within the living organization. The external causes are resolvable into two classes, namely: such as consist in changes, either in composition, quality or quantity of the natural ingesta, including under this latter term the air, water and food, and such as consist of agents not belonging to the natural ingesta, but capable of being received into the system through the same channels. I need hardly remind you that the air we breathe is composed of nitrogen, oxygen, ozone or active oxygen, carbonic acid, heat, and electricity, and that these constituents are subject to constant variations. When such variations do not exceed certain limits they are consistent with a continuance of health in the animal economy. But when they are too abrupt, or extreme, they are productive of morbid conditions, often of the most dangerous character. The atmospheric elements most subject to such extreme changes are the ozone, heat and electricity.

The most superficial observer knows that there is habitually, a wide difference between the character of diseases prevailing during the high temperature of summer and the low temperature of winter. The influence of heat in increasing the susceptibility and lessening the vital affinity or tonicity of living structures, is as apparent as its power to lessen the affinity by which the atoms of inorganic matter are held together. Many facts point to an intimate relation between extreme changes in the ozone, heat, electricity and aqueous vapor of the atmosphere, and the production of such diseases as influenza, catarrh, rheumatism, cholera, etc., and there is much need of further careful investigation in this direction. The second division of the external causes of disease, consisting of agents not naturally entering into the composition of air, water or food, but capable of being mixed with one or more of these and imbibed into the system through the same channels, arise mostly from the disintegration or decay of dead organic matter, both animal and vegetable.

Hence, from a remote period in the history of medicine, they have been styled *miasms*. Idio-miasms, when the product of the decomposition of animal matter or animal excretions; and koino-miasms, when from the decomposition of vegetable matter. Until a comparatively recent period these deleterious products were very generally regarded as inorganic gaseous or chemical compounds, although so subtle and attenuated as to be ever eluding the best directed efforts of the chemist to isolate and examine them. By a few, however, like Copeland and Holland, in Europe, and J. K. Mitchell, in America, they were regarded as organic living germs, either vegetable or animal, fungi or animalculæ. And since the general use of the microscope in medical investigations, the tendency to regard all the deleterious products of the decomposition of organic matter, as organized microscopic germs capable of self-propagation, and free diffusion in connection with the aqueous vapor of the atmosphere, has greatly increased throughout all ranks of the profession. Still there is very little agreement among the various observers, and the whole subject needs much more extended and patient investigation.

In all our researches with the microscope, concerning the nature of morbid causes, great care is required, lest we mistake the mere products or results of morbid action, for the causes. For instance, if we examine the surface of a sore on the skin, or of an ulcer in the mucous membrane of the mouth, and find it covered with fungi or vegetable germs, it does not necessarily follow that such fungi were the cause of the diseased spots in either place. Neither does it follow as a legitimate deduction that cer-

tain violent epidemic diseases, as cholera, for example, arise from organic germs merely because such have been seen in the excretions. To furnish data for any legitimate deductions from this class of observations, they must be made at the very incipient indications of disease, and repeated at the different stages of its progress, and after full recovery. Similar observations must also be made during the progress of other diseases affecting the same organs or structures. The first series of observations are necessary to determine whether the supposed germs are always present in a given disease ; and whether present in all stages of its progress, or only at certain periods. The second series are necessary to determine whether they are peculiar to the one disease or present in many and dissimilar diseases. One observer places a few specimens of cholera evacuations on the microscopic field, and observing certain organic germs, which on keeping a certain length of time, develop into a species of fungus, and he straightway announces the discovery of the direct cause of cholera. Another places a specimen of the blood of a syphilitic patient on the microscopic field, and after patiently watching it for two or three days, a crop of living bodies make their appearance, and we have another grand pathological discovery.

But just as the literature of the profession has become well filled with the important discoveries, and the many practical applications of which they are capable, behold some one else has also discovered that the special cholera fungus can be found as well in any serous intestinal evacuation, and that the so-called syphilitic germs are easily found in the blood of persons who never dreamed of having had that disease, either hereditary or acquired. It is thus that one set of investigators are constantly employed in correcting the errors of another class, and our literature is kept full of contradictory statements.

Hasty generalization, or the deduction of important conclusions from imperfect and inadequate data, has ever been one of the greatest hindrances to genuine progress in both the science and the art of medicine.

The second class of causes, those that originate in the living system, may be called mental and physical. That either deficient or excessive mental exercise, and either sudden or long continued action of the emotions and passions are capable of inducing morbid action in the physical structures of the body, is too well known to need illustration. That the physical processes of metamorphosis and disintegration may be so imperfect or perverted as to cause unnatural products to be returned into the blood, or that the secretory action of one or more secreting organs may be so perverted as to cause the secretion to be unnatural in quantity or quality, and thereby become a cause of irritation and derangement, is equally obvious. This simple and hasty glance at the subject of etiology will be sufficient to show you both the importance of the indication for removing the causes of disease, and the practical difficulties in the way of fulfilling it.

I stated that the second indication for the use of remedies in medical practice was founded on the nature of the disease. For instance, if the nature of the disease is such as to present increased activity and excitement, it indicates the use of soothing and sedative remedies; if increased sensibility and suffering, either narcotics or anæsthetics; if impaired activity and relaxation, excitants and tonics; if perverted vital affinity, alteratives, etc. I need not tell you that a very large part of the skill and success of the practitioner will depend on the clearness of his appreciation of the nature of the morbid actions involved in any given case, and the accuracy with which he adjusts the remedial agents to meet the indications afforded thereby.

The third indication was founded on the secondary effects of the primary disease, and the complications that supervene during its progress. The several organs and functions of the human body are so intimately connected with, and dependent on, each other, that it is almost impossible to have disease invade one without soon causing disturbance in others. And there are few individuals who do not have a greater susceptibility in some organs than in others, and hence, when attacked by general diseases, such sensitiveness often becomes so increased as to constitute active local disease. And it often happens that the secondary affections become the most dangerous to the life of the patient. This is illustrated strikingly when any one of the principal excretory organs is involved. Thus, disease of the kidneys may be of such a nature as to prevent a proper elimination of urea, which being retained in the blood, poisons the cerebro-spinal nervous system, producing convulsions, coma and death. Or valvular disease of the heart, by keeping up for a long time irregular circulation of the blood, causes general derangement of secretion, especially scantiness of urine and general dropsy.

The practitioner, therefore, should study carefully the mutual relation and dependencies of one function on another, that he may be prepared, not only to treat the secondary derangements when they occur, but to enable him often to anticipate their occurrence by appropriate preventive measures.

All details concerning etiology, pathology, diagnosis, and therapeutic action of medicine, will be given in connection with the consideration of particular diseases and groups of diseases; my present object being simply to give you such an outline as would challenge your attention, and systematize your thoughts in relation to these topics.

LECTURE V.

The Examination of the Sick.—By Inspection, Oral Questions, Palpation or Touch; Instrumental Aid—The Principles of Diagnosis—Therapeutic Methods, etc.

ONE of the most delicate and important duties of the physician is to examine his patient. The object of such examination is to ascertain the location, extent, nature, stage of progress, and coincident derangements, of whatever disease or diseases may afflict the patient, together with the causes that may have been efficient either in producing it or perpetuating its existence. To accomplish this object fully, requires on the part of the practitioner, patience, kindness, gentleness of manipulation, close undivided attention, the mental discipline that gives quickness of perception and accuracy of comparison and induction, with that easy boldness which quietly assumes nothing to be immodest that is necessary for a full understanding of the nature and extent of the disease, and yet which sacredly avoids all not thus necessary. To place the patient at ease, and at the same time secure attention, it is best to commence the examination with a few leading questions, such as, "How long have you been unwell?" "How did your sickness commence?" "Do you suffer much pain; and if so, where?" "Is it sharp, dull, burning, constant, or paroxysmal?"

Having thus introduced the examination far enough to allow any feeling of trepidation or embarrassment that might have been felt by the patient, to have subsided, and at the same time to have obtained an outline of his particular suffering, you should, without apparent design, pass directly to a methodical examination so complete as to elicit a correct knowledge of all the important functions and processes performed in the system. By simple inspection you observe the physiognomy or expression, the hue of the skin, the position or attitude, voluntary and involuntary movements, general contour or relative development of parts, and the particular appearance of the tongue, with such other parts as may be the seat of special complaint. All this, except the two last items, may be accomplished while proceeding with the oral part of the examination.

After the leading introductory questions already suggested, the further prosecution of the oral examination should take such direction as to elicit as full an account of the several important functions as the patient is capable of giving. Perhaps the most natural and easy method is to interrogate consecutively concerning the organs engaged in the work of digestion, assimilation and nutrition; those engaged in the opposite processes of disintegration and excretion; then those constituting the nervous system, both cerebro-spinal and ganglionic; and finally, those concerned in re-production, especially in females past the age of puberty. When the patient is too young or too sick to answer properly the necessary inquiries, the same should be directed to the nurse or whoever has immediate care of the patient. There are some diseases, like those of a typhoid character, that always blunt more or less the sensibilities of the patient, and often render the manifestations of mind so inactive as to cause very imperfect or erroneous answers to be given. In other cases we have just the opposite, namely, such an increase of nervous sensitiveness as to cause the most extravagant expressions and the wildest exaggerations. It is proper and desirable always to have the nurse or some reliable member of the family present during the examination of such patients, because they will greatly assist in correcting erroneous statements and in supplying defects in the patient's memory. And it is a good rule in all delicate cases, and such as involve apparent mental derangement, to have a free, confidential interview with the nurse alone, during which you can canvass the statements and condition of the patient, without danger of exciting either his suspicions or his anger. I need not say this should be done entirely out of the sight and hearing of the patient. Nothing so quickly excites the fears or the suspicions of a conscious patient, as private conversation or *whispering* in his room. All conversation in the presence of the sick should be in a mild, kindly tone of voice, just loud enough to be easily understood, but wholly free from all abrupt and boisterous qualities.

The correctness of the information obtained from patients will depend much on the manner in which questions are asked. If they are too general in their character, the patient will often fail to comprehend their full meaning, and give erroneous answers in consequence. For instance, many when asked if their food digests well, answer promptly, yes; and yet when asked more particularly, acknowledge that the food often lies heavy in the stomach after eating, or that they have frequent belching of gases, and sometimes acid eructations. So, too, in regard to excretions. I have seen many patients who, when asked "if their bowels were regular?" answered without any hesitation, "Yes, they were all right." But when asked specifically how often they had a fecal evacuation, some said once in three or four days; others, three or four times every day; while others said once a day. The better way is to ask directly how often the patient has an evac-

uation from the bowels? and what is the color and consistency of the evacuation? The same rule is still more necessary in obtaining a knowledge of the renal secretion. Unless their attention has been previously called to the subject, many patients will not be able to give a reliable statement either as to the quantity or quality of the urine, but will answer in general terms that they think it is about natural. Others will say they "make a great deal more" than natural, when they really make it very *often*, but only a little at a time. Patients laboring under low forms of fever and paralytic affections, not unfrequently have either partial or complete paralysis of the muscular coat of the bladder. This is liable to cause—first, retention until a certain degree of distention of the bladder, and then dribbling so as to keep the clothing wet, or the passage of only a few spoonfulls at a time. In all such cases, in addition to careful inquiries of the nurse, the physician should daily examine the hypogastric region sufficient to determine whether the bladder is distended or not. I have known a neglect of this latter rule to lead to several serious mistakes. It is only a few weeks since that I was requested to see a young man reported to be very dangerously sick from disease of the brain. On calling at the house, I met the attending physician, and after listening to a brief history of the case, entered the sick man's room. The patient was entirely comatose; chin dropped; pupils a little dilated; breathing irregular; skin clammy; pulse frequent and very feeble; and frequent irregular muscular twitchings. The latter with a strong urinous odor about the bed, caused me to inquire whether the patient had passed his water regularly. The attending physician answered in the affirmative. Turning to the nurse, I asked *when* he passed his water last? Her answer was, "he passes it every little while, and his bed is wet now." "How long has he passed his water in the bed?" I inquired, at the same time passing my hand down over the region of the bladder. "Three days" was her reply. The hand at once detected a great degree of fullness in the hypogastrium, which further examination proved to be owing to the presence of a bladder so much distended that its fundus reached the umbilicus. The introduction of a catheter gave exit to an ordinary chamber vessel full of ammoniacal urine. The attending physician, not a little chagrined, excused himself by saying he had not examined the region of the bladder because the nurse had assured him every day that the patient had passed his water freely. In most cases of chronic disease presenting obscure questions in relation to their pathology, and especially if accompanied by serous or dropsical effusions, the physician should directly examine the urine, aided both by chemical tests and the microscope.

Palpation or Touch.—While the acquisition of an easy, systematic and accurate method of oral examination is of great importance to the physician, it is never sufficient to give him a full and correct knowledge of the condition of his patient, without the aid of direct contact or touch. By the latter we gain a knowledge of the temperature and other qualities of the skin; the state of the circulation as indicated by the force, frequency and regularity of the pulse; the fullness and regularity of respiration; the tension or flaccidity of muscles; the existence of hyperæsthesia and anæsthesia, the existence or non-existence of indurations, enlargements, tumors, abscesses, dropsical effusions, etc.; and the physical condition of the parts within the chest and the abdomen. In young children, and in patients of all ages, whose mental perceptions are disordered by disease, direct physical examination, coupled with inspection, constitute our chief means for acquiring a knowledge of the morbid conditions under which they may be laboring.

Instrumental Aid.—To render this part of the examination of patients more complete, various instruments have been constructed, some of which are of great practical value. The ophthalmoscope, otoscope, rhinoscope, laryngoscope, stethoscope, microscope, sphygmograph, thermometer, urinometer, speculums, with test-tubes, spirit lamp, and chemical re-agents, constitute the chief instruments which the physician of to-day may bring to his aid in determining the existence, nature, stage of progress, and tendencies of disease. I do not say that a physician cannot acquire skill, and even superior skill, both in the diagnosis and treatment of disease, without familiarity with the use of many, and perhaps all of these instruments. And yet it must be admitted that each one of them, properly used, is capable of adding both to the extent and accuracy of our knowledge concerning the morbid conditions it is designed to aid in investigating. It is desirable, therefore, that every general practitioner should be familiar with the use of all these instruments, and as far as practicable, keep them constantly within his reach. No detailed descriptions or illustrative drawings can give you an adequate knowledge of the articles themselves, or of their practical application. Such knowledge can be obtained only by direct examination and actual clinical use. Happily for you as a class, the daily hospital and dispensary clinics, which constitute a prominent part of the course of instruction in this institution, will give you ample opportunities for becoming acquainted, individually, with the practical application of every instrument and appliance that may aid in the examination and treatment of the sick. As already intimated, the primary object of all our examinations of the sick, is to ascertain whether they are afflicted by disease, and if so, its nature, extent, duration, etc.—in other words, to arrive at as full and complete a diagnosis as possible.

But what constitutes a complete diagnosis? Certainly not the mere classification or naming of the disease; for a very superficial examination may enable the practitioner to determine that a patient has typhoid fever, pneumonia or rheumatism, and yet leave him with a very imperfect knowledge of the pathological changes that had taken place in the solids and fluids of the body. A full and practical diagnosis in any given case embraces, first, a knowledge of the general nature of the disease; second, the pathological changes that have taken place, which determines the stage of advancement; third, the nature and extent of the complications, if any, that have supervened; and fourth, the physical and mental condition and habits of the patient prior to the present sickness. The first of these items gained, will enable you to name the disease; the second and third, to clearly comprehend the present pathological condition of the patient, and found thereon rational indications for treatment; while the fourth, will often enable you to anticipate the tendency or direction which other changes will take, during the further progress of the case.

The making of a full practical diagnosis is, therefore, the most important, and often the most perplexing of all the duties devolving on the medical practitioner. If he succeeds in obtaining a clear and correct knowledge of the nature, progress and tendencies of the disease under which his patient is laboring, it requires but a short and easy process of induction to arrive at the rational indications for treatment. That is, to determine what needs to be done for the purpose of either mitigating or curing the disease, and re-establishing the health of the patient. And having determined thus logically the indications for treatment which the case requires, a competent knowledge of the principles of hygiene, and of the materia medica, will readily suggest the best means for fulfilling the indications presented. I say a competent knowledge of the principles of

hygiene, as well as of materia medica, because I hope none of you will make so great a mistake as to suppose the treatment of disease consists solely in the administration of drugs.

A large part of the diseases coming under the care of the physician are caused by errors in diet, drinks, clothing, ventilation, and other matters included under the term hygiene; and no one can attain the highest degree of success as a practitioner who does not fully appreciate the importance of careful attention to the hygienic influences affecting his patients.

The object of such attention is twofold, namely: to remove or correct such erroneous habits and conditions as may be still acting as causes; and the substitution of such as will positively aid in the restoration of the patient. A comfortable temperature; a sufficient supply of fresh, pure air; clean linens; a careful adaptation of the quantity and quality of food and drink to the capacity of the digestive organs to receive and assimilate it; and a quiet, cheerful, hopeful mental influence, are hygienic conditions of universal applicability in the management of the sick. I by no means approve of the modern doctrine of *expectancy*, which assumes that diseases must run their natural course, and that *art* can do little more than properly regulate the hygienic conditions of the patient, and leave the rest to that intangible something called *nature*.

And yet I cannot too strongly urge upon you the importance of making yourselves thoroughly familiar with the facts and principles of public and personal hygiene, and constant attention to their application in the daily routine of practice. It would not be inappropriate to represent hygiene proper as bearing much the same relation to materia medica that physiology does to pathology.

Therapeutic Methods.—Before closing this lecture, I must invite your attention to a few thoughts concerning the principal therapeutic methods, or systems, as they are sometimes called, that have found advocates among the leading members of the profession in this and the preceding generations. Since the earliest periods of medical history, therapeutics, or the application of remedies in the treatment of disease, have been made to conform more or less closely to the co-existing ideas or doctrines in relation to the nature of disease itself. When the nature and phenomena of diseases were regarded as dependent on certain chemical processes called concoction, fermentation, crisis, etc., the prevalent therapeutic system was founded on corresponding chemical notions, and had for its leading objects the hastening of the supposed concoctions, the maturing of the morbid humors, and their expulsion or neutralization.

When the theories of vitalism gained the ascendancy, and all diseases were regarded as involving either debility (direct or indirect), or irritation, the prevalent therapeutic ideas were soon found aggregated into two leading and opposing systems. The one, founded on the pathological doctrine of debility, had for its leading object *stimulation*. The other, suggested by the idea of irritation, excitement, etc., had for its purposes diminution of excitement by sedation and evacuation, and hence popularly termed antiphlogistic. During the first quarter of the present century the pathological doctrines of irritation and inflammation gained their most complete control over the mind and practice of the profession. Almost every morbid condition was referred to one or the other of these processes; and as a consequence, bleeding, general and local, emetics, purgatives and alteratives, were in constant requisition in the treatment of even the most trivial ailments. But coincident with this supremacy of the antiphlogistic method in therapeutics, came the rapid development of organic chemistry, the application of the microscope to the study of minute anatomy, both

healthy and morbid, and the discovery of the fact that many acute diseases were self-limited in duration, and capable of progressing to recovery without the active interference of art. By the first, our knowledge of the composition and properties of the various morbid products, whether in the tissues, the blood, or the secretions, was greatly increased; and the doctrines of exclusive vitalism began to yield to a recognition of zymotic and blood diseases. By the second, histological investigations were pushed in every direction, unfolding the minute anatomy of all structures, healthy and morbid, and culminating in the doctrine of *cell* growth as the basis of organic structures, and in the cellular pathology of Virchow.

By the third, a distrust or skepticism concerning the curative powers of medicines was rapidly engendered, and a confidence in the restorative processes of nature correspondingly increased.

This tendency soon found marked expression in the writings of Jacob Bigelow, John Forbes, O. W. Holmes, and others, and did not stop until it had effectually checked the heroic use of active remedial agents that had been developed under the preceding doctrines of inflammation and antiphlogistic therapeutics. Under these various influences, the former theories or systems of medicine have been abandoned, and yet no other one law, either pathological or therapeutical, has succeeded in gaining any general control over the professional mind. The last twenty years have been characterized by great activity in the accumulation of facts, and the multiplication of experiments, in almost every department of medical science.

Indeed, it may be regarded as pre-eminently an era of observation and independent research, untrammeled by authority. And yet, you must not imagine that the present, with all its independence of thought, activity of observation, and vast accumulation of facts, is free from the influence of fanciful theories and bold attempts at generalization. The human mind, in the present, as in all the ages of the past, is not only prone to generalize—to frame hypotheses based on a limited number of facts, but having gained a favorite standpoint, to see all else through light radiating from that focus. Hence the enthusiastic microscopist, after tracing all organized structures to formation out of primary cells; and structural changes, whether healthy or morbid, to normal and abnormal cell evolutions, naturally enters upon the study of etiology with the favorite instrument in hand, and soon finds organic germs, either animal or vegetable, in the blood, the secretions or the excretions of patients laboring under almost every variety of disease. And these germs are at once heralded as the efficient cause of the diseases with which they are associated. It requires but a hasty glance over the medical literature of the day to see that we have a large class of writers and investigators who are already referring the origin and propagation of cholera, yellow fever, influenza and other epidemics, as well as many of the endemics, to organic germs. As all these organic germs have their definite periods of development, maturity, propagation, and decline, it is consistent and natural to infer that the diseases to which they give rise should also have a definite course to run, which cannot be materially altered by treatment. Hence the *therapeutic* doctrines of this class are fairly expressed in the words palliation and expectancy, while they place great emphasis on hygiene and preventive measures. Another class, with their standpoint of observation in the laboratory of the organic chemist, see in the living system only a complicated series of chemical actions and reactions taking place in the blood, and between the constituents of that fluid and the organized tissues. So long as these processes are well balanced, the evolution of heat, electricity

and nerve-force is natural, and health is preserved. But when, from any cause, the equilibrium is disturbed by some change in the chemical factors, the results are also abnormal and disease is established. By this class we have all the ancient doctrines of humoralism revived under the modern terms septicæmia, zymosis, blood degeneration, etc. Their therapeutics are, of course, largely antiseptic and antidotal.

A third class have their standpoint of observation in the physiology and pathology of the nervous tissues, and they find little apparent difficulty in satisfying themselves, at least, that almost every variety of action that takes place in living matter, whether healthy or morbid, is under the control of nervous influence.* With such, the chief end of therapeutics is to modify the various morbid conditions of structure and function in nerve matter.

But a fourth, and much larger class than either of the foregoing, possessing no definite scientific or theoretical standpoint of observation, being swayed by the general current of reaction from the antiphlogistic system, and captivated partly by the simplicity of the doctrine that all disease is a diminution of life,† and partly by the plausable eulogies of "nature" and *her* all-controlling power‡ over disease, they have become essentially skeptical in therapeutics, and content to regulate the hygiene of the sick-room, amuse the patient with placebos, and wait for "nature" to cure the disease. Or, more properly, perhaps, wait for the disease to complete its course and disappear; for we find the greater part of this class, not only skeptical in regard to the curative powers of medicines, but also firm believers in the doctrine that diseases have an independent existence marked by growth, maturity and decline, which makes them in a great measure independent of the influence of medication.§ At a period when investigations are pushed with so much vigor in every direction; when new facts are constantly appearing, and old facts are being presented in new aspects; and when so much that is recognized as a part of medical science is but partially or imperfectly known, it is not strange that our literature should be filled with contradictions, better calculated to bewilder than to enlighten the student.

And yet, gentlemen, if you will patiently study the views I have presented to you in the preceding lectures, concerning the elementary forms of disease, the methods of investigation, the indications for treatment, and the principles governing the application of remedies, you will be able to follow me in the study of special pathology and therapeutics in such a way as to become rational and efficient practitioners; neither investing disease with the attributes of independent existence and self-determined duration, nor regarding the curative powers of medicine with a melancholy, vacilating skepticism.

There is one fact in therapeutics that I wish to impress indelibly upon your minds. It is that the special influence of any and every remedial agent depends much upon the actual condition of the patient at the time it is administered. For instance, a remedy that, administered in health, or in some conditions of disease, would produce a direct sedative or debilitating influence, if given in some other conditions, would result in relieving the sense of oppression and weakness, and adding to the strength of the patient. All writers class veratrum viride, aconite, and digitalis among the sedatives, yet I have seen many patients so debilitated by insufficient oxygenation and decarbonization of the blood, caused by an irregular, trem-

* See Brown-Sequard's lecture in the Toner course, at Washington, D. C., 1873.
† See Chambers'.
‡ See Essays of Bigelow, Forbes and Holmes.
§ See Dr. Gibson's Address before the British Medical Association in 1870.

ulous action of the heart, that they could not walk across their room, who, when placed enough under the influence of these articles to render the heart slow and steady in its beat, could walk or ride with ease. I have seen patients in the first stage of pneumonia, with the face deeply suffused with redness, the breathing short and oppressed, the pulse frequent and weak, and the feeling of prostration so marked that they were unable to rise from the bed, so relieved by one prompt, free bleeding that they could not only sit up, but walk about their room with ease. What are recognized as tonics and stimulants, given to the same patients in the same stage of the disease, instead of strengthening, would have added to the debility of the patients by increasing the local vascular fullness. Again, the same quantity of an anodyne or anæsthetic that might be required simply to render a patient comfortable when suffering from delirium tremens or severe neuralgia, might produce dangerous, or even fatal, effects, if given to the same patient when well, or the nervous system not disturbed. Hence, I repeat, that the general effect of any and every remedy will be determined very much by the condition of the patient at the time of its administration. And I can give you, gentlemen, no more important therapeutic law, or general rule of action, than to so investigate every case as to gain a clear and definite conception of the existing pathological conditions, and then apply such remedies as are most accurately calculated to remove both the morbid conditions and the causes on which they depend, without regard to either nosological arrangements or classifications of the materia medica. When the case is so obscure that a satisfactory idea of the actual morbid conditions cannot be obtained with all the aids for making a proper diagnosis that are within our reach, then be content to palliate symptoms as they are presented from day to day, by mild means, rather than hazard doing positive injury by a blind exhibition of more active remedies.

PART II.

CONSIDERATION OF INDIVIDUAL DISEASES OR PRACTICE OF MEDICINE.

LECTURE VI.

Classification of Diseases—The Object to be Attained—Extended Nosological Arrangements of Little Practical Value—The Simplest Classification the Best.

HAVING in the preceding lectures completed the discussion of those elementary principles and facts which are deemed important as an introduction to the study of special pathology and therapeutics, or practical medicine proper, I shall now enter upon the consideration of individual diseases and their treatment.

To secure order or method in our progress, and avoid repetition, it will be necessary to form some classification by which those diseases having a number of important facts relating to their etiology, pathology, or symptomatology, in common, may be grouped together. At a former period in the history of medicine, great importance was attached to the subject of Nosology; and as much learning and skill were exhibited in arranging diseases into classes, orders, species, and varieties, as was shown by Linnæus in classifying the vegetable kingdom. You may find one of the most complete specimens of these extended nosological arrangements, in the great work entitled the "Study of Medicine," by Dr. John Mason Good. All such extensive and complicated arrangements, however, have been found imperfect and unprofitable.

During the last quarter of a century, some writers have attempted to classify diseases in accordance with their supposed causes, calling one group Zymotic, another Parasitic, etc. Others have made anatomical structures the basis of their arrangement; and still others have made the important organs and groups of organs the basis. But both these latter methods lead to the grouping together of diseases the most dissimilar in their nature, and our knowledge of etiology is too imperfect to render it reliable as the basis of a general classification. For our purposes the following arrangement, which I sketch before you on the blackboard, will be found sufficient:

CLASS I. GENERAL DISEASES.	Sub-class I. Idiopathic fevers, or acute general diseases . .	Continued, Periodical, Eruptive.
	Sub-class II. Constitutional diseases or chronic general diseases	Of the Blood. Of Nutrition.

CLASS II. LOCAL DISEASES.	Sub-class I., Inflammations.
	Sub-class II., Fluxes.
	Sub-class, III., Neuroses.
	Sub-class IV., Miscellaneous.

You will see that I have arranged all diseases first into two great classes, simply denominated *general* and *local*. By a general disease I mean one whose primary or initial symptoms are such as to indicate disturbance of those properties and processes that are common to all the organs and structures of the body. When any morbific cause is permitted to act upon the living system in such a way as to disturb the general properties, susceptibility and vital affinity, it necessarily disturbs the processes of nutrition, disintegration, and calorification; in other words, it develops at once symptoms of general disturbance. It is proper, therefore, to designate the disease thus induced a *general* disease.

On the other hand, when the primary symptoms of disease are limited to disturbance of the function of a single organ or group of organs, and the system generally remains undisturbed or becomes involved only secondarily, the disease is called *local*. Nearly all of the more active or acute local affections so interfere with some important function as to induce more or less general disturbance during their progress.

In like manner, all the general diseases are liable to become complicated with strictly local affections during some part of their course.

The general diseases constituting the first class, may be conveniently divided into two sub-classes, which I shall call *idiopathic fevers* or acute general diseases, and *constitutional* or chronic general diseases. The first are essentially acute or active in their progress, self-limited in duration, and accompanied by appreciable changes, both in the qualities of the blood and the properties and molecular changes of the tissues. The *second*, are not acute except in the development of local disease; not self limited in duration; and often existing for years without inducing appreciable changes in the blood or active disturbance of the more general processes of the animal economy. The first, or febrile division, originates from such causes as are capable of diffusion in the atmosphere, probably in connection with aqueous vapor, and of suspension in water, or from changes in one or more of the natural constituents of the atmosphere itself When the causes depend on certain local conditions, and are limited to certain geographical and geological districts, becoming active in the production of disease at certain parts of every year, they are termed endemic When they are developed to a state of activity at irregular intervals, without strict regard to geological formations, and causing disease to attack large numbers in any given community, they are called epidemic.

The second, or constitutional division, have their origin from causes that generally act with feeble intensity, but persistently through long periods of time, such as errors in diet, drinks, exercise, clothing, and hereditary influences. These may result in impoverishment of the blood, spanæmia, from insufficient assimilation of food; or in rendering the blood impure by interfering with the processes of disintegration and excretion, thereby retaining the products of tissue metamorphosis until they excite irritation in particular structures, as in gout and rheumatism. Some of these causes may induce not merely insufficient but imperfect assimilation, and consequent perverted nutrition, as in scrofula and the various morbid growths and deposits.

A closer study of this class of diseases will enable us to arrange them into two groups; one, in which the prominent and constant characteristic condition is an unnatural or morbid state of the blood; and the other, in which the more prominent characteristic is altered nutrition and its results.

The first group includes gout, rheumatism, and constitutional syphilis. The second, scrofula, tuberculosis, carcinoma, and leucocythæmia.

That gout and rheumatism are results of retention in the blood of certain chemical substances resulting from the processes of tissue metamorphosis, and which in the healthy condition are excreted chiefly through the skin and kidneys, is now well understood. The abnormally acid condition of the fluids in rheumatism, and the excess of uric acid in the blood of patients afflicted with gout, clearly indicate the essential pathology of these affections, and fully justify their classification as blood diseases. The well-known fact that syphilis in all its stages originates from the primary introduction of a specific poison into the blood, renders any comments on its proper classification unnecessary. That these three forms of disease are *constitutional*, is shown by increased susceptibility to attacks acquired by every new outbreak; the persistent tendency to become chronic, and the liability to hereditary transmission.

Patients affected with any one of the second group of *constitutional* diseases, present no uniform changes in the chemical constituents of their blood, or in the secretions directly eliminated from that fluid. Whenever changes from the natural condition are traceable in the blood of such patients, they relate to the organic ingredients derived from the process of assimilation, such as the albumen, fatty matter, and colorless corpuscles; and when local changes are manifested, they take the form of either cacoplastic deposits or morbid growths. The first are seen chiefly in scrofula and tuberculosis, and the last in carcinoma and leucocythæmia. Those of you who are familiar with that part of medical literature relating to the last named disease, may be surprised that I should place it in this group, as writers generally have represented it as pre-eminently a *blood disease*, on account of the existence of an excess of colorless corpuscles in that fluid. It is probable, however, that such excess of corpuscles is only an effect or symptom resulting from an error in the assimilative and nutritive processes, as I shall endeavor to show hereafter.

The second general division of diseases, called *local*, may be conveniently subdivided into four groups: which will be designated *phlegmasia*, or local inflammations; *fluxes*, or such as are characterized by excessive flow of fluids; *neuroses*, or non-inflammatory affections of nerve tissues; and *miscellaneous*, or unclassifiable cases. The individual inflammations receive names in accordance with the organs or structures they affect. Thus we have in the

Cranium....	Meningitis. Cerebritis. Cerebro-Spinal Meningitis, &c.
Eye and Ear	Opthalmia and Otitis.
Chest.....	Pleuritis. Pneumonia. Bronchitis. Carditis and Pericarditis.
Abdomen...	Gastritis. Enteritis. Peritonitis. Hepatitis. Splenitis, &c.

- Pelvis ..... Cystitis. Metritis. Vaginitis. Cellulitis, &c.
- Skin..... Cutaneous Inflammations.

The enumeration might be extended to the bones, muscles, nerves, blood-vessels, lymphatics, areolar tissue, and the skin, all of which are liable to attacks of inflammation; but the foregoing will sufficiently indicate the principle which governs the application of names to inflammation in any of the structures or organs of the body.

The word *flux* or *fluxes*, which I have chosen to designate the second division of local diseases, may not appear altogether appropriate or free from liability to criticism.

Yet I have not been able to choose a better one. The group of diseases included in this sub-class are all characterized by an undue exudation or effusion of fluids from some one or more of the structures of the body. The fluid effused may be only the water holding in solution more or less of the soluble constituents of the blood, or it may be the blood itself. The first may be denominated serous, and the second sanguineous, fluxes.

The serous fluxes are again devisible into such as take place from free surfaces, and such as occur into shut sacs. The free surfaces consist chiefly of the cutaneous tissue covering the exterior of the body, and the mucous membranes lining the interior of the digestive apparatus. When the flow takes place from the former it is called diaphoresis; when from the latter it is called serous diarrhœa, cholera morbus or epidemic cholera, according to the degree of its severity. If the flow takes place into the shut sacs, consisting chiefly of the serous and synovial membranes, it having no outlet, accumulates, distends the sac, and constitutes what is usually styled *dropsy*. It is not limited, however, strictly to the membranous sacs, but may take place in the interstitial spaces of the areolar tissue and the parenchyma of some of the organs.

The same remarks are applicable to the sanguineous fluxes. The blood may flow from a free surface like the mucous membranes of the respiratory organs, the alimentary canal, and the pelvic viscera and be at once discharged, or it may extravasate into the areolar tissues in different parts of the body, and be retained an indefinite period. The several diseases included in this subdivision may be conveniently tabulated as follows:

- FLUXES.
  - Serous
    - from free surfaces of
      - Skin—Diaphoresis.
      - Mucous membranes..
        - Serous diarrhœa
        - Cholera morbus
        - Epidemic cholera
    - shut sacs
      - Serous membranes of
        - Brain—Hydrocephalus
        - Lungs—Hydrothorax
        - Heart—Hydropspericardii
        - Abdomen—Ascites
        - Articulations—Synovial Dropsy
      - Interstitial tissues—Œdema or Anasarca
  - Sanguineous
    - from free surfaces of
      - Nostrils—Epistaxis
      - Lungs—Hæmoptysis
      - Stomach—Hæmatemesis
      - Bladder—Hæmaturia
      - Uterus—Menorrhagia
      - Intestines—Intestinal Hemorrhage
    - into interstitial tissue—Hæmatocele, etc.

The third division of the second class of diseases, termed Neuroses, includes all those morbid conditions of the nervous structures that are not strictly inflammatory in their nature. Pathologically, they are susceptible of arrangement into such as are accompanied by appreciable change of structure, altered nutrition ; and such as are manifest by disturbance of function only. Under the first head we might include atrophy, or defective nutrition ; hypertrophy, or excessive nutrition ; disarrangement of atoms or cells, constituting softening ; hypertrophy of the connective tissue, with atrophy of nerve matter constituting sclerosis and metamorphosis of structure, as in fatty degeneration.

Under the head of functional disturbances might be mentioned increased sensibility—hyperæsthesia ; diminished sensibility—anæsthesia ; perverted sensibility—morbid sensations and tastes ; and corresponding alterations of transmissibility, inducing derangement of muscular action, such as rigidity, convulsions, and paralysis. At present, however, both the physiological and pathological conditions of the nerve structures are subjects of the most active investigation ; and the exact relations between clinical facts and symptoms, and the different pathological conditions just mentioned, are not sufficiently established to justify an attempt to maintain a strictly pathological classification of nervous diseases.

Therefore, I shall follow the more common practice and arrange the affections of the nervous structures under the following heads :

APOPLEXY,	EPILEPSY,	CHOREA,
CATALEPSY,	CONVULSIONS,	TETANUS,
HYDROPHOBIA,	HYSTERIA,	PARALYSIS,
HYPERÆSTHESIA,	ANÆSTHESIA,	LOCOMOTER ATAXY,
NEURALGIA,	INSOMNIA,	SUN-STROKE,
DELIRIUM TREMENS,	METHOMANIA,	MENTAL DISORDERS.

I have enumerated a fourth subdivision or groups of local diseases, and given to it the name of *Miscellaneous*, because, in the routine of general practice I have met with a number of morbid conditions so persistent and troublesome as to require much attention, and yet they could not be appropriately classified in either of the other divisions. These I shall describe to you in the closing part of the present term.

GENERAL DISEASES.

LECTURE VII.

General Pathology of Fevers—Ancient and Modern Views Compared—The Unity, or Oneness of all Fevers, and their Diversity—Pathological Conditions Common to them all.

IN the preceding lecture your attention was directed to a simple, general classification or grouping of diseases, convenient for use in the lecture-room. The first order, or sub-class of diseases named in that arrangement was the idiopathic fevers. It was then stated that the particular diseases included in this order could be conveniently grouped into three families, each characterized by certain prominent phenomena distinguishing it from the others, and yet each presenting other important phenomena common to the whole. In commencing the study of this important order of

diseases, the first question that challenges our attention is the same which has perplexed the minds of all medical philosophers from the days of Hippocrates to the present, namely: *What is fever?* Dr. James Copland, author of the Dictionary of Practical Medicine, and one of the most philosophical of English writers, first defines *fever* by simply enumerating its more constant symptoms, as, "painful lassitude, debility of the corporeal and mental faculties, alterations of the animal heat and of the secreting functions, accelerated circulation, increased thirst, and abolition of the appetites." In another place he says, "Fever is a disease of all the vital endowments, functions, and faculties of the fluids, and of the whole organization." Dr. William Aitken, a more recent English writer, collating largely from the writings of Virchow, Parkes, and Jenner, says: "Fever essentially consists in elevation of temperature, which must arise from an increased tissue change, and have its immediate cause in alterations of the nervous system." This, however, is simply returning to the brief definition of Galen:—"calor præter naturam."

Dr. George B. Wood, one of the best writers on practical medicine in this country, defines *fever* to be "an acute affection of the system, in which all the functions are more or less deranged; the most striking phenomena being sensorial, or nervous irregularity, increased frequency of pulse, increased heat, and disinclination for food." Most of the writers of the present day make no attempt to give a special definition of fever, but proceed directly to consider its history, symptoms, causes, effects and treatment. While Hippocrates and Galen regarded increased heat as the essence of fever, they attributed such increase to some morbid condition of the fluids of the body, which were then supposed to consist of bile, atrabile, phlegm and blood.

The active phenomena of the fever were supposed to result from the concoctions taking place in the humors or fluids, and the efforts of nature to expel the morbid products. This was the ancient humoral doctrine, familiar to all students of medical history, that under some modification held sway over the professional mind until the time of Hoffman and Cullen. The progress of anatomy and physiology had developed some knowledge of the special functions of the nervous structures and their influence over the blood-vessels; and Hoffman was one of the first to trace many of the more prominent symptoms of fever to a morbid condition of the nerves. Spasm of the capillaries under nervous influence he regarded as the first step in the development of fever; while the subsequent heat and arterial excitement was caused by the reaction or efforts of the system to overcome this spasm.

Cullen enlarged, revised and moulded these crude ideas of Hoffman into a *nervous* theory of fever so plausible and popular that it soon gained complete supremacy over the doctrines of the Humoralists; and so fully concentrated the attention of investigators and writers upon the functions of the solids or organized structures, that all theories of disease or morbid action soon became as exclusively *solidistic* as they had previously been *humoral*. Of course, the doctrines of Cullen were modified from time to time, with each important advance in the departments of physiology and organic chemistry, and yet it is not difficult to recognize some of them still holding an important place in the writings and teachings of many eminent members of the profession in our own time. Thus, Dr. John Eberle, author of one of the earliest systematic works on Practical Medicine in this country, says: "The first link in the chain of morbid actions, which occur in the development of fever, always commences in the nerves." *

*See Eberle's Practice of Medicine, 2nd Ed. Vol. I, pg. 12.

Dr. George B. Wood, in his most excellent work on Practical Medicine, which for many years was one of the best text-books in our language, says: "Whether the fever is idiopathic or symptomatic, the first decided step towards its formation seems to be some morbid impression upon the nervous system, and this impression seems to be of a depressing nature."* It is by this supposed depressing influence on the nervous system that all this class of neuro-pathologists endeavor to explain the formation of the initial chill or cold stage that ushers in most fevers, while the fever proper is represented as the reaction of the system against this depression. But Dr. Wood was too close and accurate an observer at the bedside, not to recognize the fact that there was something here more than mere nervous depression and consequent reaction. Hence, on the same page from which I have quoted, he adds, with characteristic candor: "We may thus partially explain the condition of the chill, but there is *something more* which we do not fathom; something in which the chill of fever *differs* from other instances of nervous depression." And in reference to the re-action, he adds: "But there is here also something more than mere re-action. There is the continued action of the cause, a diversified play of sympathies in one case, a widely pervading influence from some unknown agent in another; and fever is not purely, as some have maintained, the *resilience* of the depressed system."

Dr. Southwood Smith, physician to the London Fever Hospital, and one of the ablest and most logical English writers, in the latter part of the first half of the present century, in his interesting work on fevers, published in 1830, not only claims a unity or oneness in the essential pathology of all fevers, but he places that pathology in disturbance of the functions of the nervous, circulating, and secreting organs, not taking place simultaneously but in an invariable order of sequence. Hence he says: "The order of events, then, is first, derangement in the nervous and sensorial functions; this is the invariable antecedent; secondly, derangement in the circulating function; this is the invariable sequent; and thirdly, derangement in the secreting and excreting functions; this is the last result in the succession of morbid changes."† Dr. Daniel Drake, in his valuable work on the Topography and Diseases of the interior valley of the North American Continent, does not discuss the pathology of fevers as a class, but in alluding to the *modus operandi* of the efficient cause of periodical fevers, says: "The paroxysmal character, not less than the symptoms that characterize this stage, shows that the function of *innervation* is deeply involved and embarrassed. We may, in fact, admit that it is the *first* affected."‡ And again, in discussing the pathology of the typhous family of fevers, he says: "The history of the typhous fevers indicates an early, if not a *primary*, morbid state of the *innervation*, which all the phenomena declare to be one of adynamia with irritation, a failure of the *vis nervosa* with perversion; a degradation with abnormal molecular actions."§ These allusions to some of the most eminent writers on practical medicine, are sufficient to show that even to the present time, the doctrine that the first step or link in the chain of morbid actions taking place in the development of idiopathic fevers, is a disturbance of the functions of the nervous system. Indeed, most medical writers appear to recognize no mode by which an impression can be made upon the organized structures of the body, except by a primary action on the nerves. They appear to recognize no properties common to all tissues, by which

* See Wood's Practice of Medicine, 5th Edition, Vol. I. p. 112.
† See A Treatise on Fever by Southwood Smith, M. D. p. 62, 1830.
‡ See Drake on the Principal Diseases of the Interior Valley, &c., Vol. II, p. 51.
§ See idem, page 498.

they, like the primary germinal cell or aggregation of bioplasm, are capable of receiving impressions and undergoing molecular changes, both healthy and morbid, independent of mere nervous influence.

Indeed, Dr. Austin Flint, in writing on this subject, says directly: "There would seem to be, in fact, in the body only two anatomical systems having relations so extensive as to be able to give rise to the train of morbid phenomena in fever, viz: the *nervous system* and the blood."* Yet he, like many of those who have written during the last two decades, places the *primary* morbid changes in the blood, rather than in the nervous structures.

If you examine carefully the current literature on this subject, you will find a large majority of the writers of our own time, referring all fevers to specific causes, such as organic germs or infectious miasms that gain access to the blood and produce their primary deleterious impression on some of the constituents of that fluid. Partly to these morbid changes in the blood, and partly to the direct presence and influence of the infection, is attributed the primary morbid impression upon the functions of the nervous system, and through it upon all the other functions of the body. Not a few, however, place all the more important primary changes constituting the essential pathology of fevers in the blood itself; and thereby adopt doctrines as strictly *humoral* as were entertained, by any of the ancients. Whatever may be the opinions entertained, however, in regard to the primary changes or first links in the chain of morbid actions in the development of idiopathic fevers, there is a very general disposition, at the present time, to regard the pyrexia or increased heat as the one essential pathological condition common to all fevers. So prominent, indeed, is the place assigned to increased heat as the essential morbid condition in fevers, by writers of the present day, that to it are attributed nearly all the molecular or structural changes that take place in the organized structures of the body; and its control within proper limits is presented as the chief object of treatment. Indeed, the expressions used by many, both in speaking and writing, fairly convey the impression that increased heat and fever are convertable terms; or in other words that *fever* is essentially increased heat. Yet, a moderate amount of careful observation at the bedside, is sufficient to demonstrate that in every case of general fever, there is a co-existence of many functional disturbances, of which calorification, or increased heat is only one; innervation another; circulation, secretion, nutrition, and tissue disintegration are others. And an adequate amount of impartial clinical observation shows, also, that there is no uniform order of sequence in these disturbances, but rather that they are developed coincidently from some cause capable of disturbing all simultanously, though not always in the same degree, nor in the same direction. To call either increased heat or disturbed innervation fever, is simply to mistake a prominent symptom or effect of disease for the disease itself.

To define fever as the "reaction" of living structures or vital forces against primary impressions of a depressing character, or as the "effort of nature" to throw off or expel some offending material, as has been done so long, is simply to use words and phrases that convey no definite pathological meaning, as I have already explained to you in the second lecture of the present course. If the complex and very important morbid condition universally recognized as a *fever*, is not merely increased heat, nor the reaction, or "*resilience*," of the system from nervous depression, nor yet

* See Flint's Practice of Medicine, 3d Edition, p. 808.

a mere alteration of the blood, the question recurs: what is it? Must we agree with Dr. Wood, that it is something we cannot fathom—something too remote in the intricate processes of the living system to be observed, analyzed, and understood by the human mind? I think not. On the contrary, it has seemed to me that the obscurity resting upon this subject has depended entirely on the failure to recognize the existence of those general properties belonging to all living matter, which I endeavored to explain to you fully in the second lecture of the present course. While *fever* does not consist primarily in either an alteration in the blood, a depression or disturbance of the nervous functions, the circulatory, the secretory, the nutritive, or calorific processes, alone; it does consist in the action of some cause capable of disturbing the general elementary properties common to all the organized structures, which I have called susceptibility and vital affinity; and it is the active disturbance of these properties that soon involves disturbance of all the functions and processes named; not in any fixed, consecutive order, but simultaneously, as from a common cause. The nervous structures have special well-defined functions, imparting sensibility, voluntary and organic; and directing muscular action, both voluntary and involuntary.

By thus receiving and transmitting impressions and regulating muscular action, they serve the purpose of placing one organ in relation with another; they influence the caliber of all vessels containing muscular fibres in their coats, and thereby influence the quantity and motion of the blood in the vessels of each part; by thus influencing the quantity and motion of the blood, they indirectly influence the activity of secretion and molecular motion, and consequently to a certain extent nutrition and disintegration; and by influencing all these they carry an influence to a limited extent over calorification. It can thus be seen that morbid impressions made on the nervous system, may consecutively and indirectly involve all the functions and processes of the living system. But it is also true, that the derangements thus produced by primary impressions on the nerves, whether of a depressing or exciting character, differ widely from the phenomena of an idiopathic fever. If you study closely every recognized morbid state of the nervous system, from the highest state of nervous excitement to the lowest stage of nervous depression, you can find nothing either in the symptoms, progress or results, that bear even a moderate resemblance to the symptoms and progress of a general fever. On the other hand, it must be admitted that mere alterations in the blood alone cannot produce the phenomena of general fever. The blood may be, and doubtless generally is, the vehicle into which the morbific agents constituting the efficient causes of fever, are received, and in which such agents are conveyed to every structure of the body. And it is the impression of these morbific agents, thus conveyed simultaneously to all parts of the organized structures, directly upon the properties common to all, that produces, coincidently, general disturbance of all the functions and processes performed in the system. It is the action of some agent, conveyed in the blood, capable of producing an active disturbance of the elementary properties—susceptibility and vital affinity—by which the excitability and molecular changes in all the tissues are controlled, that constitutes true fever. It is this simultaneous disturbance of all the functions and processes, by active impressions on the properties common to all living structures, that essentially distinguishes general fever from local diseases of an irritative or inflammatory character.

While most of the general diatheses and constitutional diseases and tendencies result from causes acting with feeble intensity, but persistently

upon the same general properties; the general fevers all result from causes acting temporarily, but with greater intensity, and thereby producing acute general functional disturbance, instead of mere modifications of nutrition and temperament. If it be true that fever consists essentially in an acute general disturbance of the functions and processes of the animal economy, from the impressions of some toxæmic agent acting upon the general elementary properties common to all living organized matter, as I have claimed, you can readily appreciate the truth of Dr. Copland's assertion that there is a "*oneness*" or unity in all fevers. Such oneness or common bond of union consists in the primary disturbance of the same general properties, from the direct impression of any and all causes capable of inducing general fever. But while all the causes capable of producing fever act primarily upon the same general properties, thereby making a common point of departure in the establishment of pathological changes, yet each specific cause impresses these properties in a direction peculiar to itself; and hence leads to the development of symptoms and pathological changes equally peculiar, thereby explaining the diversities seen in the different forms of fever. For example, one cause or group of causes, may so act as to increase both the *susceptibility* and the *vital affinity*, thereby producing a fever of direct excitement, corresponding to the *Synocha* of the ancients, and the irritative, evanescent, or transitory fever of later writers.

Another may so act as to depress both properties, and thereby lead to the phenomena characteristic of the typhoid and typhus family of fevers.

Another may produce such an impression as to increase or exalt the susceptibility, while it impairs the vital-affinity, thereby inducing fevers of high temporary excitement with impaired tonicity of tissue, represented by the family known as periodical fevers. Still another group of causes may act in such direction as to increase the excitability or susceptibility, while they pervert the vital affinity in a manner differing from simple increase or diminution, and by which specific molecular changes and combinations are effected, as seen in the group of specific eruptive fevers. These diversities in the primary pathological conditions resulting from the action of different causes on the same general properties, may be seen, perhaps more clearly, by the following tabular statement, which I place before you on the blackboard:

ELEMENTARY PROPERTIES.	Susceptibility, Vital Affinity	Both increased..	Fever of Pure Excitement. Febricula.
	Susceptibility, Vital Affinity	Both diminished	Fever tending directly to Debility or Functional Impairment. Typhoid Group.
	Susceptibility	Increased	Fever of high temporary Excitement, with impaired Tonicity, etc. Periodical Group.
	Vital Affinity	Impaired	
	Susceptibility	Increased	Fever of Excitement, with specific local developments and formation of Specific Products. Eruptive Group.
	Vital Affinity	Perverted	

Having thus stated as clearly as possible the first and essential link in the chain of morbid actions constituting the pathology of fevers, I will

next direct your attention to the more important subsequent changes, at least so far as they are common to this whole class of diseases. The first important effect resulting from a disturbance of the general elementary properties, is an alteration of the molecular movements in the various tissues, which necessarily involves coincident disturbance of the processes of nutrition, disintegration, secretion, calorification and innervation.

The movement of atoms, cells, or molecules in all the tissues taking place under the guidance of these properties, and adjusted to certain natural relations between the motion of the blood in the capillaries, the sensibility of the vaso-motor nerves, and the affinity of the structural elements; whatever alters the latter, must of necessity alter in a corresponding direction the movements themselves.

And as the evolution of heat in the living body is the result of atomic changes in the tissues, it must increase or diminish, *pari passu*, with the increase, diminution, or perversion of such changes. The idea that carbonaceous foods are used in the living system for the support of respiration and animal heat, as taught by the chemico-physiological school of Liebig, is contrary to many well-known physiological and pathological facts, and was fully disproved by a series of experiments performed by myself in 1850, the results of which were presented to the American Medical Association in May, 1851, and published in the Chicago Medical Journal the following month.*

You must remember, however, that the accumulation of heat, or the actual temperature of the living body, as indicated by the clinical thermometer, does not necessarily, or even generally, correspond with the rapidity of direct heat production, either in sickness or health. For while all those atomic or molecular changes taking place in the tissues by which the moving matter passes from a rarer to a denser condition, increases the sensible heat; those by which the matter passes from a denser to a rarer condition, absorb, or render sensible heat latent.

It is plain, therefore, that the actual temperature of the body at any given time will depend as much upon the diminution of the latter processes, as upon an increase of the former.

Among the most important of the latter processes are the eliminations from the lungs and skin. From the mucous membrane lining the whole extent of the respiratory passages and the cutaneous surface, water is constantly being converted into aqueous vapor, by which a large amount of sensible heat is rendered latent and the temperature of the body correspondingly reduced. As a general rule, during the active stage of all fevers, these extended surfaces are drier than natural, and it is highly probable that the accumulation of sensible heat is due more to the diminished exhalation of aqueous vapor than to any other one cause. From these remarks you will readily perceive that while the evolvement of heat in the living human body results directly from the molecular or tissue changes, its retention in a free state depends more upon the degree of activity in the conversion of water into aqueous vapor in the processes of elimination from the cutaneous, pulmonary and intestinal surfaces.

Therefore, while the increased heat in one case of fever may depend on an increased activity of molecular changes in the tissues; in another it may depend partly on increase of these changes, and partly on lessening of the exhalations of aqueous vapor; and in still another, the same elevation of temperature may be owing entirely to the diminished exhalations from the

* The maintenance of a nearly uniform temperature throughout the whole *forty days* of recent fasting by Dr. Tanner, is also strong evidence that the production of heat in the system is not dependent on the ingestion of any particular kind of food.

free surfaces of the body, while the rapidity of the tissue changes may be only natural, or even less. I am aware that many neurological experimentalists regard it as an established physiological law that the metamorphosis of tissues and the production of heat, are regulated by the nervous system.* But an attentive study of the results of experiments, in connection with abundant clinical observation, has satisfied me that the only influence exerted by the vaso-motor or trophic nerves over tissue changes and temperature, results from their power to increase or diminish the contraction of the blood vessels, and thereby alter the quantity and motion of the blood in any given part. Yet a more or less profound disturbance of the functions of the nervous structures of the body is present in all fevers. The direction and intensity of such disturbance will vary, however, not in any strict consonance with the variations of febrile heat, but rather with the character and intensity of the exciting cause, and the previous predispositions of the individual patient.

Another condition common to all general fevers, is a profound disturbance of those molecular changes which constitute secretion, and tissue change. But while such disturbance always exists in a febrile condition, there is no uniformity in its direction or activity. As I have already told you, most of the writers on fevers at the present time regard the increase of *heat* in fevers as the direct result of increased tissue changes. If this were true, we ought to find a uniform ratio between the rapidity of such changes as shown by the quantity of the *excreta*, and the degree of fever heat. But the results of my own observations, as well as those of Parkes, Virchow, Wunderlech, Joseph Jones, and many others, show no such uniform relation. On the contrary, the quantity of the *excreta* passing from the skin, lungs, kidneys, and bowels, whether considered as a whole, or from each source separately, varies much in the different varieties of fever, and in different cases of the same variety. And these variations are found to have no *uniform* relation to the variations in the febrile heat.†

Again, we find in the progress of all the varieties of idiopathic fever, decided changes in the quality and constituents of the blood.

If you keep in mind the fact that the blood is the primary receptacle for all the products of tissue changes, as well as for the new material received through the organs of digestion and assimilation, you will see how readily the condition of the blood must be affected by whatever seriously disturbs the processes of either assimilation, nutrition, or disintegration. And, as I have already shown these processes to be profoundly altered by the action of all causes capable of inducing general fever, you would expect to find the blood more or less changed as a necessary coincident condition. But if it were possible for the processes just named to remain natural during the progress of a general fever, and the function of excretion through the skin, lungs, kidneys and bowels, by which the products of tissue-change and other materials are separated from the blood, was interfered with, speedy alterations in that fluid would necessarily result. Again, the specific poison that constitutes the direct exciting cause of the disease, may, on entering the blood, exert a morbid influence on the constituents of that fluid, as suggested by Murchison, Flint, and many other recent writers.

It is probable that all the three modes by which the quality and quantity of the constituents of the blood are capable of being changed, co-ex-

*See the recent very interesting researches of Dr. H. C. Wood, of Philadelphia, Published by the Smithsonian Institute.

†See Aitken's Science and Practice of Medicine, p. 262, Vol. 1.

ist in most cases of general fever, but in very varying degrees of importance in different cases. For instance, in those constituting the group, which, in the preceding lecture I classed as *continued fevers*, we find an excess of most of the elements derived from tissue changes, with little deficiency of those of a nutritive and formative character, but a decided impairment of the quality or properties of both classes of constituents. The coagulability of the fibrin is impaired or entirely destroyed; the red corpuscles are darker color, and cease to attract each other in forming *rouleaux* as in health; the hæmatin escapes, tinging the serum and the fluids often found in the serous cavities, a redish color; and in typhus, as well as in the more malignant cases of other members of this group, there is an excess of ammonia, with an unusual tendency to putrifactive changes.

On the other hand, in the members of the group classed as periodical, characterized by frequent critical or periodical evacuations, as in the copious sweats that terminate each paroxysm of an intermittent, there is seldom found any excess of the ordinary products of tissue changes, or much apparent impairment of the properties of either fibrin or red corpuscles, but a marked diminution in the quantity, or relative proportion, of all the nutritive and formative constituents, more especially of the albumen and red corpuscles. The latter I have found in many cases reduced much below one-half of their natural proportion. Frierich, J. Forsyth Meigs, and others, have shown by numerous microscopic examinations, that the blood in this class of fevers generally contains a notable quantity of a black pigment, in the form of small, dark granules. The same material is also found in the structures of the lungs, spleen, and liver. It is highly probable that this pigment is developed in some way from the rapid disappearance of the red corpuscles.

Finally, another important circumstance common to all the essential fevers, or acute general diseases, is their self-limited duration. This results in part from the essential nature of the morbid conditions which constitute a general fever, and in part from the nature and special affinities of the specific causes that give rise to those morbid conditions. If I am correct in asserting that a direct disturbance of the elementary properties of the living structures, sufficiently acute to profoundly alter the general processes and functions of assimilation, nutrition, secretion, innervation, and calorification, constitutes the essential pathology of all general fevers, it must be evident to all of you, that such active universal disturbance cannot be maintained indefinitely. It must terminate within a limited period of time, or it will necessarily work such changes in the organized tissues, as well as in the blood, that the life of the patient must cease. A careful study of the natural progress and results of all the varieties of this great and important class of diseases, has shown that all the milder cases inherently tend to recovery within from one to six weeks, and the more severe to the destruction of life within a similar period unless modified by the interference of appropriate remedies.

Having thus explained the nature of the morbid impressions and resulting morbid actions which constitute the true pathology of idiopathic fevers, and the more important facts and conditions common to them all, I must next direct your attention to the special consideration of each group separately. I shall therefore enter upon the consideration of the continued fevers at the beginning of the next lecture hour.

LECTURE VIII.

Continued Fevers—Their General Characteristics—Individual Members of the Class—Divisible into Three Groups, with Distinct Etiological Characteristics—First Group, Simple Continued Irritative or Transient Fever, or Febricula.

GENTLEMEN:—Having, in the preceding lecture, presented a brief review of the opinions that have been entertained in regard to the general pathology of fevers, and pointed out those changes and symptoms common to the whole class, I now invite your attention to that subdivision or group of acute general diseases called continued fevers. The members of this group, though presenting considerable variety in regard to their etiology, symptoms and results, still present a sufficient number of items common to the whole to justify the placing of them under one head. First, in all of them the febrile symptoms may be regarded as continuous from the beginning to the end of the disease—at least from the initial stage to the approach of convalescence. It is this continuity of the febrile symptoms throughout the course of these diseases that has given to them the title of *continued fevers*. By continuity I do not mean evenness or uniformity in the symptoms, for in each member of the group the temperature and other active symptoms may vary much in intensity from day to day, or at different parts of the same day; but they do not wholly disappear and return again at such regular intervals as to constitute periodicity. Second, while all the members of this group are self-limited in duration, in the same sense that I have defined the self-limitation of all acute general diseases—that is, they must terminate within a limited period of time, either in the convalescence or the death of the patient; yet no one of them presents such an approach to exactness in the duration, either of its successive stages, or of its whole course, as is seen in the fevers classed as eruptive. On the contrary, they vary much, both in the relative and absolute duration of their several stages, and of their entire course. For instance, the prodromic or forming stage, may vary in length from a few hours to one or two weeks. The active febrile stage may last only a day, or continue four weeks. The defervescence, or stage of decline, may be abrupt, and marked by critical evacuations, or gradual. These remarks are not only true when comparing one member of this group with another, but in relation to the different stages of the same variety of fever. If you take typhoid fever as the most important member of the group, you may find the forming stage varying, in different cases, from three days to two weeks; the active febrile stage, from two to four weeks; and the stage of defervescence, from three to seven days; making the whole duration of the disease in different cases from three to six weeks. This is in marked contrast with the more definite length of each stage of the eruptive fevers, and also with the limited duration and regularity of the return of the paroxysms of the periodical or malarious group. Third, in the members of this class or group there is not that manifest tendency to eliminate the specific cause through one or more of the excretory organs, as seen in the copious sweats that end each distinct paroxysm of the periodical group; nor to fix it by some special affinity in a single structure, as seen in the lodgment of the specific viruses or contagions in the skin and portions of the mucous membrane, in the members of the eruptive group.

In consequence of this failure to effect an early separation of the special exciting cause or fever poison, when such exists, and its consequent longer retention in the blood, together with the coincident accumulation of some of the products of disintegration or waste of tissues, the blood undergoes a more marked and uniform deterioration of the quality of its constituents than in either of the other groups of fever.

The particular fevers which I shall include in the group called *continued*, are the following: Simple Irritative or Accidental Fever, Influenza, Dengue, Typhoid, Typhus, Relapsing, Plague, Yellow fever, Erysipelas, and Diphtheria.

Causes.—While all these varieties of fever are properly grouped together as acute general diseases of a continued type, they differ much in their causes, symptoms and results.

The three first named appear to be caused principally by the influence of atmospheric conditions acting primarily on the cutaneous and pulmonary surfaces in such a way as to interfere with the proper eliminations, thereby causing the retention of effete material capable of disturbing the properties of the tissues and suddenly developing a fever of marked excitement but of brief duration. The atmospheric conditions alluded to may consist in sudden and extreme changes in the temperature and moisture, or in the quantity of active oxidizing agents, as ozone, hydrogen peroxide, etc., and do not include a specific contagion, infection or fever-poison. Being thus produced mostly by alterations in, what I may term, the natural constituents and qualities of the atmosphere, these varieties of fever are liable to attack large numbers of people almost simultaneously, and to extend rapidly over large districts of country. On the other hand, the typhoid, typhus, relapsing fever and plague, are supposed to originate from the action of specific poisons, developed either from the decomposition of animal matter, or from the excretions of those sick with the same disease. These specific poisons are, by some writers, styled *idio-miasms;* by others, infections or contagions; and by others, simply *fever-poisons.* They are capable of suspension in air, water, milk, and probably in many other articles of food and drink ; and with these they may be introduced into the human system, either through the lungs or stomach, and possibly by cutaneous absorption. Suspended in these various articles, they may be transported from place to place, and retain their activity, provided they are kept in confined limits, as in unventilated rooms, holds of ships, trunks, boxes of goods, or clothing, etc.

But free exposure to unconfined and pure air, either destroys or dilutes them to such a degree that they become harmless.

Whether the infections which give rise to the typhoid, typhus, relapsing fever and plague, are so many specific agents existing in the form of bacteria, micrococci, or other microscopic germs, the propagation of which is favored by the accumulation of animal excretions in a moist state; or whether they are inorganic gaseous products of the decomposition of such matters, is not satisfactorily determined. A majority of the writers and investigators of the present day favor the germ theory. Whatever may be the special form of these specific fever-poisons, however, investigations have fully established the important fact that they accumulate and manifest their activity in the production of fevers, in direct ratio to the accumulation of animal matter and excretions in poorly ventilated and overcrowded dwellings, narrow streets and alleys, cellars, cesspools, and the moist soil of yards and lots around dwellings, whether in the city or the country.

Hence, the fevers they produce are found wherever the population by its

density or carelessness, causes the accumulation of excrementitious matters sufficient to contaminate either the air of dwelling houses, or the water furnished for domestic use, with little or no regard to latitude, longitude, elevation or geological formations. The facts I have just stated furnish the basis of a large part of the sanitary improvements of modern times. Practically, it matters but little whether we know the identity of any specific fever-poison or not, provided we gain an accurate knowledge of the conditions governing its production and the laws of its diffusion ; for so far as such conditions are under human control, they enable us to limit its evolution and spread as effectually as could be done by an antidote to a known poisonous agent. Concerning the three remaining fevers in this group, namely, yellow fever, erysipelas, and diphtheria, each appears to depend on a causation peculiar to itself, which may be more appropriately considered in connection with the clinical history of each disease than at the present time. Like the influenza and dengue, they prevail chiefly in an epidemic form, attacking large numbers in a community within a limited time ; but more limited in their topographical range, and much more plainly dependent on the direct action of some specific infection.

Definition of the words infection, contagion, and miasm.—As the words infection, specific infection, contagion or contagium, and miasm, will necessarily be frequently used when speaking of the causes of disease throughout the succeeding lectures of this course, it is necessary that I should explain the meaning of each; or rather the sense in which I shall use them. It is the more necessary that I should do this, because some authors and teachers use them simply as synonyms, freely interchangeable; while others attach a definite meaning to each, and yet differ much in defining such meaning. By the word *infection*, I mean a substance or *materies morbi* developed from the deteriorative changes in animal matter and animal excretions outside of the living body, which is both capable of perpetuating and propagating itself where the atmospheric impurities and other local conditions are favorable, and also of producing sickness when introduced into the living body, either by inhalation with the air, or imbibition with food and drink ; but is not itself re-produced, at least not in an active form, in the living bodies of those laboring under the disease it has induced.

While the agents thus called infections may re-produce and perpetuate themselves in an atmosphere of the proper temperature and containing the necessary impurities, and thereby give rise to the prevalence of diseases of an epidemic character in localities to which they have been transferred in connection with baggage, articles of merchandise, etc., they are wholly incapable of doing so in localities where such temperature and impurities do not exist. By a *specific* infection, I mean one developed from some particular animal excretion or organic matter derived from patients laboring under some form of disease, and which is capable of producing the same disease in other parties with whom it may come in contact. For instance, many claim that there is in the discharges from the alimentary canal of patients sick with typhoid fever, cholera, etc., some constituent, which though harmless at the time of being voided, is capable of development by exposure to the air into an active infection that may produce the same diseases in other parties if imbibed either with the air, water or food. You will thus perceive that an infection is a substance, or disease-producing agent, developed into activity outside of the human body and under certain local conditions, by which it may so rapidly multiply or propagate itself as to infect the whole atmosphere of cities or districts of country, and attack such large numbers of people as to constitute an epidemic of greater or lesser severity.

By contagion, or contagium, I mean a *materies morbi*, or specific poison developed in the body of the sick, which, when brought in contact with another unprotected person, will produce in such person the same disease, thereby communicating a particular form of disease from individual to individual without regard to local conditions of any kind. For instance, if you place a patient affected with small-pox or measles in contact with another unprotected individual, in any atmosphere, however pure and at whatever temperature, the person so exposed will imbibe the contagion, or virus, and suffer from the same disease, during the progress of which the morbid material will be reproduced in quantity sufficient to inoculate any number of others who may come within its influence. The various contagiums developed in the bodies of those laboring under the acute general diseases to which they give rise, may escape with the cutaneous and pulmonary exhalations in sufficient quantity to impregnate the air immediately around the patient, and may communicate the same form of disease to those who may be brought in contact with such air; or they may be communicated by inoculation with the blood or with the virus gathered from sores on the body of the sick. The contagium of syphilis, and perhaps a few other diseases, does not appear sufficiently volatile to impregnate the atmosphere surrounding the patient, and consequently is communicable only by inoculation or actual contact. All contagions, however, are capable of becoming attached to the clothing worn by the sick, and with such clothing may be transported in trunks, boxes, etc., to any other place, and retain sufficient activity to communicate disease to such parties as may receive them. In regard to portability or capability of being transferred from place to place in confined air, contagiums and infections are alike; but they differ entirely in their mode of propagation. The contagiums develop only in the bodies of those sick, and spread from individual to individual, while the infections develop outside of the human body in air containing certain impurities and at favorable temperatures, and they spread disease to many simultaneously or in rapid succession through an infection or poisoning of the atmosphere without regard to personal contact of one individual with another. Small-pox, measles, and scarlet fever are good examples of diseases produced by contagiums; and typhus, plague, yellow fever, and erysipelas, of those produced by infections. I shall use the word *miasm* to indicate any of the products derived from the decomposition of organic matter, whether animal or vegetable, and capable of diffusion in the atmosphere. Those derived from changes in animal matter and animal excretions may be distinguished as idio-miasms, and those from vegetable matter as koino-miasms. Of course, most of the contagiums and perhaps all of the infections would be included under the more general term miasm.

FIRST GROUP OF CONTINUED FEVERS.

Simple Continued or Irritative Fever.—Having given you these preliminary statements and definitions, I now invite your attention to a consideration of the most simple variety of acute general diseases, called simple fever, irritative fever, or febricula.

History.—Cases of this variety of fever have occurred in all ages, in all climates, and among all classes of people. This is owing to the fact that it depends upon the action of no one special cause, but from any influence, mental or physical, that is capable of producing an abrupt and active disturbance of the properties and functions of the system.

Before pathological anatomy had made sufficient advancement to afford

a foundation for distinguishing one fever from another, all such distinctions were founded entirely on the symptoms and tendencies as observed at the bedside of the sick.

Those presenting the most active and quickly developed febrile phenomena were classed under the head of Synocha. Those presenting considerable activity, yet slower in development and of longer duration were classed under the word Synochus. And those of the lowest type tending in their progress to early and dangerous prostration, were classed as Typhus. Under this arrangement the febricula or ephemeral cases of fever were included with those called Synocha. But as pathological anatomy became more generally and minutely studied, it was made apparent that the more protracted cases under the head of Synocha, nearly all of those classed as Synochus, with a small number ranked as Typhus, constituted but one form of fever presenting different degrees of severity, but the same general course and attended by the same pathological lesions. Consequently they were placed together under the name of Typhoid fever; while the remaining grave cases continued to be called Typhus. Many have carried this re-arrangement so far as to omit all recognition of simple continued or irritative fever, classing all the cases under the heads of typhoid and typhus. Such is the case in the works of Bartlett, Ziemssen and Bartholow. In doing so, however, they ignore some of the plainest facts of clinical experience, and place in the same group cases essentially different in causation, symptoms and pathological results. That cases of well marked general fever are frequently met with, which arise from various accidental or non-specific causes, run a brief course, and almost always terminate in recovery without any special or characteristic structural changes, is acknowledged by a large majority of writers and practitioners both of this and past generations.* If we include these cases with those classed as typhoid, we not only violate the principle which constitutes the basis of all classification, by grouping under one head cases essentially dissimilar, but we vitiate all the statistics of typhoid fever proper, both in regard to the effects of remedial agents and the ratio of mortality. I shall therefore continue to maintain the distinctions here indicated, and give you a brief statement of the symptoms, causes, pathological changes, and treatment of simple fever.

Symptoms and Progress.—This form of fever usually commences abruptly, without any marked forming or prodromic stage, and in most instances without a noticeable chill. In a small proportion of the cases, patients have complained of feelings of indisposition or lassitude one or two days; but the attack is generally ushered in with pains in the head, back and limbs; flushing or redness of the face; increased heat and dryness of the skin; a thin white fur on the tongue; accelerated and full pulse; respirations more frequent; urine less in quantity and deeper color; bowels inactive; appetite impaired; considerable thirst and general restlessness. The temperature of the body rises rapidly, generally reaching its climax in from six to twenty-four hours, at which time it will range between 40° and 42° C. (102° and 108° F.)

The temperature thus reached, and the assemblage of symptoms enumerated, may continue only a few hours, before they commence notably to abate coincident with the commencement of some critical evacuation occurring either spontaneously or induced by the action of remedies. In other cases they may continue, with but little change, from one to four or five days, when they decline rapidly, accompanied by some critical evacu-

* See Aitken's Science and Practice of Medicine, Part I, pages 560–562.

ations, and convalescence is established. As this grade of fever is one of pure excitement, caused by some agent or influence capable of exalting the properties of the tissues, it must terminate either in an early convalescence, or in the establishment of some local inflammation, or in such decline in the activity of febrile excitement as to impart a more typhoid character to all the symptoms. It appears to be impossible, from the nature of the elements and processes involved, that a fever of direct excitement or exaltation of the properties of living structures, such as I have just described, should continue beyond a very limited period of time without undergoing one of these three changes or destroying the life of the patient. In the great majority of cases, the rapid accumulation of the products of tissue changes in the blood caused by the general diminution of the secretory and eliminative functions, so far diminishes the stimulant influence of that fluid, within the first twenty-four hours, that the morbid excitability begins to decline, and soon reaches a point favorable for the resumption of natural molecular changes, when the skin, kidneys, and pulmonary surfaces resume active eliminative work, and the fever spontaneously disappears. Such a result, as I have already stated, may occur at any time, from three hours to as many days; and is often hastened by the patient's taking freely of diluent drinks, and bathing the head, face, and hands in cool water. When this favorable change does not happen, by the third or fourth day, the lips become more dry; the whole countenance more dull; the pains in the head, back, and limbs less acute; the pulse softer but more frequent; the mind more dull, and sometimes wandering; the mouth more dry and tongue more thickly coated with a brownish strip along the middle line; the urine remains scanty; and the bowels inactive. In a word, such cases begin to show a tendency to a lower grade of excitement, and an approximation towards the typhoid aspect. Every day of further continuance makes this approximation more manifest; especially in hot climates, or in the summer and autumn of colder ones, until before the end of the second week the whole tongue and mouth become dry; the temperature from 40° to 41° C. (102° to 106° F.); skin dry; the countenance more dingy and dull; mind more wandering; and the abdomen moderately tympanitic, with intestinal discharges of a thin, brown or grayish color. The common expression of the attending physician is, that "the case commenced as a simple fever or bilious attack, but has run into a *typhoid condition*." In temperate climates nearly all of these cases convalesce before the middle of the third week; but in warm climates they sometimes terminate fatally. In the cold season of the year some of the attacks of this variety of fever become protracted in duration, and more dangerous, by an early supervention of catarrhal inflammation in the mucous membrane of the bronchial tubes, not unfrequently extending into isolated lobules of the lungs.*

Pathological Anatomy.—As this variety of fever rarely terminates fatally, the opportunities for post mortem examinations are still more rare. In the few instances in which such examinations have been made, the pathological lesions were simply such as had resulted from local complications.

Etiology.—As I have already remarked, simple irritative fever has no one specific cause; but may be produced by the action of any cause or combination of causes that are capable of inducing, either directly or indirectly an active exaltation or increase of the elementary properties and functions of the system. Careful observation has shown that the most common

*See Address of Dr. Wm Pepper, President of Section on Practical Med., etc. Transactions of the American Medical Association for 1881.

causes are exposure to extreme heat, or sudden and severe changes of temperature; violent mental emotions of an exciting character, such as sudden anger or great joy; and the use of irritating ingesta, as indigestible food and stimulating drinks. A large majority of the cases of this fever occur in childhood and youth, and are chiefly traceable to the two first named causes. Continuous exposure to high temperature, when not accompanied by a corresponding increase in the conversion of free into latent heat by active eliminations from the skin and air passages, causes the temperature of the system to rise rapidly with increase of susceptibility and derangement of molecular movements in the secreting organs and tissues generally, thereby establishing an active febrile excitement, or irritative grade of fever, with all its usual symptoms. Cases arising from this cause are common in India and other tropical countries, and often involve such sudden and extreme rise of temperature with so great an interference with the molecular changes, as to prove rapidly fatal. They are much more rare in the temperate and colder regions, but even here cases are met with every summer during the waves of high atmospheric temperature, and not unfrequently pass under the names of *sun fever* and partial sun-stroke. But in our climate exposure to sudden and extreme changes of temperature, by which the eliminations from the skin and respiratory surfaces are so violently interfered with that waste material of irritative quality is caused to rapidly accumulate in the blood and tissues, where it directly excites the properties of the whole to a febrile grade of activity, is, beyond doubt, the most common exciting cause of simple or evanescent fever. That sudden and severe mental emotions of an exciting character, are capable of occasionally producing so decided an influence over the vaso-motor nervous functions as to suddenly check secretory and eliminative actions, and quickly induce well marked febrile phenomena, has been acknowledged through all periods of medical history.

Treatment.—Whatever may have been the cause or causes giving rise to an attack of this variety of fever, the sudden rise of temperature coincident with greatly retarded excretory actions and consequent rapid accumulation of effete matters in the blood and tissues, which uniformly characterize it, present two well defined indications for rational treatment. These are, to reduce the excess of heat, and restore the activity of the excretory and eliminative functions. If these are successfully accomplished early in the progress of any given case, full convalescence follows and no further treatment is needed. But in all the more protracted cases, there is a third indication, namely, to detect and efficiently counteract, by proper means, the beginning of any local inflammatory complications. It is true that many of the attacks of simple fever terminate spontaneously without the aid of the physician, within twenty-four hours, by simple rest, abstinence from food, bathing the head, face and arms with water, and the free use of diluent drinks. It is also true, that nearly all of the attacks would terminate favorably by a continuance of these same simple remedial influences for several days in succession. It is neither a legitimate nor logical conclusion, however, that because a disease is naturally limited in duration, and very generally tends to recovery without the interference of art, therefore, it is not necessary or proper for the physician to interpose any treatment. On the contrary, it is clearly his duty to study carefully the processes by which nature effects a recovery of the patient and by the judicious and timely use of such remedies as will aid the same processes, not only hasten their work, but render it more certain and complete. To reduce the temperature of the body and the rapidity of the circulation down to the standard favorable for the resumption of active

secretory and eliminative action, is the first step in the treatment. This is most readily and fully accomplished by frequent sponging of the whole surface with water as cold as is comfortable to the patient, and the internal administration of some cardiac or vascular sedative in doses sufficient to reduce the force and frequency of the pulse more nearly to the natural standard. And if the sedative can be combined with some agents that allay restlessness and promote the eliminations from the skin and kidneys, and the patient is allowed the free use of cold water for drink, the rational indications for treatment will be more fully met. For the purposes just mentioned I have long used, with much satisfaction, the following combination:

℞	Spiritus Ætheris Nitrosi,	50. c.c.—℥iss.
	Tincturæ Opii Camphoratis,	50. c.c.—℥iss.
	Tincturæ Veratri Viridis,	5.c. c.—℥i.

If you give to an adult four cubic centimeters or an ordinary tea spoonful in a tablespoonful or two of water, every two or three hours, according to the intensity of the fever, you will soon reduce the pulse to 70 or 75 per minute, and bring on general perspiration, with some nausea. As soon as these effects are obtained, you must increase the interval between the doses, aiming to so graduate the effect as to hold the febrile action in check without carrying the sedative effect of the veratrum viride far enough to induce vomiting.

Similar effects may be obtained by the efficient administration of aconite and gelseminum, and still more speedily by one or two doses of propylamin sufficient to produce its free sialagogue and diaphoretic effect. In most cases no further treatment is necessary; the fever being once subdued and general secretory action restored, does not return. If the bowels, however, should be slow to move, evacuations may be hastened by a mild saline laxative. In cases where the fever has already continued twenty-four hours or more before the physician is called, and he finds the tongue much coated and the urinary secretion very scanty and high colored, much advantage may be gained by giving at the beginning of the treatment, in addition to the frequent spongings and arterial sedatives, one or two powders, each containing nitrate of potass, pulverized, five decigrams (gr. viii,) and calomel two decigrams (gr. iii.) rubbed together with a little sugar, and following in about four hours with a saline laxative sufficient to cause two or three intestinal evacuations. But the free use of emetics and cathartics at the commencement of attacks of irritative fever, before the temperature and high excitability of the tissues have been modified by the antipyretic use of water externally, aided by internal sedatives, as was customary in former times, and is still recommended by some writers, is productive of more harm than good. The active determination they cause towards the gastric and intestinal mucous membranes often aids directly the establishment of such a degree of local hyperæsthesia as to both protract the duration of the fever, and increase its disposition to assume a typhoid character. My own observations have served to sustain the remark of Dr. Eberle in his work on practical medicine, which was a text book nearly half a century since, to the effect that he had never seen a case of simple continued fever in which an active emetic had been administered at the beginning of the attack, that reached final convalescence in less than three weeks. When local inflammatory complications exist in connection with this variety of fever, they must be treated on the same principle, and with the same remedies as would be required for the same grade of inflammation unassociated with a general fever. As the duration of cases of simple fever under judicious management is generally very brief, the period of convalescence is also short, and attended by no special sequalæ.

LECTURE IX.

Influenza—Its History, Symptoms, Causes, Prognosis and Treatment; Dengue—Its History, Symptoms, Causes, Prognosis and Treatment.

GENTLEMEN: The disease to which I shall call your attention first at this hour, is known under various names, as Influenza, Epidemic Bronchitis, Epidemic Catarrh, LaGrippe, etc. The first, which is of Italian origin, I shall adopt as the most familiar to the profession. Influenza is a general febrile disease usually abrupt in its access, irritative in its grade of activity, of brief duration, but pretty uniformly accompanied by a grade of inflammatory action in the mucous membrane of the respiratory passages.

History.—This disease has frequently prevailed in an epidemic form, and was pretty accurately described as early as the tenth century. Its periods of epidemic prevalence have been remarkable for the rapidity of their progress, the wide extent of territory over which they pass, and the great numbers of people attacked. It has several times prevailed over nearly all the countries of Europe and Asia.* Perhaps the most noted periods of its prevalence in this country were in 1761-2, 1775, 1807, 1831-3, 1847, 1857 and 1872-4,—at which times it not only extended its prevalence over all the inhabited parts of this continent, but also over the greater part of Europe and Asia. The disease has generally been represented as originating in the northern part of Asia, and spreading from thence to the southeast over Europe and crossing the Atlantic to America. For instance, the great epidemic of 1761-2, is by most writers described as having originated in Chinese Tartary, from whence it spread over Russia, Germany, Holland and the British Islands; and from the latter southward through France and Italy, to the Mediterranean, and westward across the Atlantic to America, which it is represented to have reached in October, 1762.

On the other hand, however, Noah Webster, in his "Brief History of Epidemic and Pestilential Diseases," published in London, 1800, describes the disease as extensively prevalent in America during the year 1761, and as passing from thence to Europe in 1762. The same writer claims that the disease passed from America to Europe in three other important epidemics, *i. e.* 1698, 1757, 1781. The truth is, gentlemen, that a careful examination of the best accounts of a large number of the important epidemics of influenza, shows no uniformity whatever, either as to their place of origin, direction and the extent of their spread, or the rate of their progress. The writers of each country that it invades, attribute its origin to some neighboring country; while in different epidemics the spread has been in opposite directions.

As I have just stated, that of 1762 first appeared at the northeast of Europe in February, London in April, and France in July; while that of 1775 was first noticed in Italy, from whence it appeared to extend directly northward until it reached the north of Europe; and in the epidemic of 1847, it was prevailing simultaneously at Copenhagen, London and Marsailles. Indeed one writer who claimed to have examined the histories of all the noted epidemics of this disease for the three last centuries, came to the conclusion that the general course of spread was from the west to the east.

* See Aitken's Science and Practice of Medicine, p. 706.

The rapidity of its progress, or more properly, the length of time between its appearance in one section of a country and another more or less distant, is very variable. Thus the epidemic of 1762, had invaded nearly the whole of Europe during the first six months of the year; that of 1830–1–2 occupied more than eight months to extend from St. Petersburg to the south line of Germany; while that of 1847 made its appearance in all parts of Europe within the short period of six weeks. The great epidemics of influenza to which I have thus far alluded, have occurred at periods of time varying from ten to fifty years; and have differed much, both in regard to the number of persons attacked and the severity of the disease. They have also occurred at all seasons of the year, and in all parts of the globe, not omitting the islands of the ocean.

Symptoms.—As a general rule the attacks of influenza are sudden and without any forming or premonitory stage. The first noticeable feelings of illness are generally coldness, varying in degree from simple rigors or sensations of coldness in the back and limbs to a severe chill of half an hour in duration. This is accompanied by feelings of depression, shrinking and paleness of the surface, variableness of respiration and pulse, with dull pains in the head, back and limbs. This stage soon gives place to a steady and continuous grade of fever, characterized by heat and dryness of the skin, some redness of the face, congestion of the vessels of the conjunctiva, moderate fullness and frequency of the pulse, some thirst, with little or no relish for food, bowels inactive, urine diminished in quantity but deeper color, and severe pains in the head, especially through the frontal, temporal, and orbital regions, with some pain in the back and limbs. Generally, within twenty-four hours from the beginning of the attack, the mucous membrane of the respiratory passages becomes severely congested, causing coryza, copious thin secretion from the nostrils, some soreness in the fauces, hoarseness, harsh cough, with a sense of tightness or constriction in the chest, and great sense of weakness. You have thus all the symptoms of a moderate grade of general irritative fever associated with acute catarrhal inflammation of the membrane lining the nostrils, fauces, pharynx, trachea, larger bronchial tubes, and sometimes the frontal and maxillary sinuses. The symptoms usually reach the climax of severity during the second day, and continue with but little change in their general character from three to seven days, terminating in either a profuse sweat or a temporary diarrhœa, most frequently the former. With these apparently critical evacuations the general febrile symptoms disappear, and the local catarrhal irritations soon follow, leaving the patient fully convalescent, but weak. Although the pyrexia in this disease is continuous, it varies much in intensity in different epidemics, and in different cases occuring in the same epidemic. The temperature ranges from 38° to 40° C. (101° to 104° F.), and may vary from one to two degrees during the same twenty-four hours; the exacerbation generally taking place in the evening.

The discharge that takes place from the nostrils and from the membrane lining the fauces and bronchial tubes, is, in the early stage, thin and generally copious, but after the third day it becomes more opaque, less in quantity, and more easily dislodged. In the most severe class of cases the catarrhal inflammation extends to the membranes lining the frontal sinuses and antrums, not only adding much to the pains in the head and face, but sometimes causing, in the advanced stage, sudden and copious discharges of a yellowish serum, or muco-purulent fluid through the nostrils. The symptoms and progress of the disease, as I have detailed them to you, correspond with my personal observations during the severe epidemics of

1847, 1857 and 1872–3. Sporadic cases of influenza, presenting all the more characteristic symptoms that I have enumerated, are met with during the cold seasons of every year. They are most frequently seen during the first one or two mild days following a protracted period of severe cold.

Prognosis.—The disease varies much in its severity in different epidemics, and in different cases occurring in the same epidemic. As a general rule, its prevalence is attended by only a small ratio of mortality. Most of the fatal cases occur in infancy or early childhood, and in old age ; and are largely due to the supervention of pneumonia, pleurisy, or capillary bronchitis. And yet most writers claim that its prevalence increases the fatality of consumption and other diseases accompanied by exhaustion, to such an extent, that the years of its epidemic prevalence are accompanied by a general ratio of mortality above the average.

Pathological Anatomy.—Though the disease generally completes its course in from three to seven days, and ends in the recovery of the patient, yet, in all the more severe epidemics a sufficient number of fatal cases have occurred to afford ample opportunities for post mortem examinations. The only important pathological changes noticed have been those of intense injection of the vessels of the mucous membrane lining the nostrils, pharynx, trachea, and larger bronchial tubes, causing redness and tumefaction of the membrane as in other cases of inflammation. So far the pathological changes belong to the disease and correspond with the severe catarrhal symptoms which constitute a part of the clinical history of each case. But most of the post mortems have also proved the existence of pneumonic congestion and hepatization, and a few have revealed appearances of active inflammation in the mucous membrane of the ilium and colon. These, however, are properly regarded as complications, very liable to occur in patients at either extreme of life—infancy or old age.

Etiology.—The causes of influenza have not been reliably ascertained. The suddenness with which the disease is developed in an epidemic form, the great extent of territory over which it prevails, and the large number of persons simultaneously attacked, render it highly probable that its efficient cause or causes exist in the atmosphere. It is not a contagion developed in the bodies of the sick; and there is no evidence that it is ever communicated from one individual to another. At an early period, Dr. J. K. Mitchell, of Philadelphia, suggested that it originated from minute cryptogamic bodies diffused in the air. In 1868, Dr. J. H. Salsbury, of Cleveland, published a paper claiming the discovery of a species of infusorium in the nasal discharges of a considerable number of cases of this disease, and which he regarded as the exciting or essential cause. Other microscopists, however, have not confirmed the correctness of his observations.

Schonbein, after discovering the existence of ozone in the atmosphere, and testing its irritating effects on the mucous membrane of the air passages, claimed with much confidence that epidemics of influenza were caused by an excess of atmospheric ozone. Nearly all the older writers attributed the disease to sudden and violent changes in the temperature, moisture and electric conditions of the atmosphere. On the other hand, in nearly all the more recent medical works, it is merely suggested that the theory of organic germs will most easily explain the phenomena presented by the history and symptoms of the disease, accompanied, however, by the frank confession that there are not a sufficient number of well established facts to justify an inference as to the efficient cause or causes of the disease. I am not able to see how the theory of organic germs affords any more rational explanation of the origin and prevalence of the disease than any of the other hypotheses.

It must indeed be, not only a remarkably accommodating, but really ubiquitous kind of organic germ that could in one epidemic propagate and diffuse itself over the whole of Europe, from the Mediterranean Sea to the north of Russia in six weeks; or over our own country from the Atlantic border to the Rocky Mountains, and from the St. Lawrence to the Gulf of Mexico in the same length of time; and in another be six weeks in extending from London to Edinburgh, six months in extending from Moscow to Vienna, and two years in reaching over both Europe and America. Or that could propagate itself and manifest its ravages almost simultaneously in all the latitudes or varieties of climate, soil and meteorological conditions between the equator and the poles. All we know of organic germs would tend to place them in the same relations as living bodies of larger size, which we well know are propagated and spread, only under certain pretty uniform conditions, and in accordance with fixed laws.

From many years of observation, coupled with the well established fact that cases of sporadic influenza, presenting almost every symptom of the cases of epidemic disease, occur every year during the first forty-eight hours of warm atmosphere following a protracted period of intense cold, I am strongly inclined to the opinion that the efficient causes of influenza consist in such sudden and extreme atmospheric changes as are capable of producing correspondingly severe disturbances of the elementary properties and molecular movements of living structures. I am the more inclined to this view from the additional fact, that the epidemic influenza sometimes attacks the horses, dogs, and other domestic animals, as severely and extensively, as it does the human species. This was true of the remarkable epidemic that occurred in our country in the autumn of 1872. But this, like many other questions in etiology, will not be settled satisfactorily, until continuous and reliable records concerning all appreciable atmospheric conditions are kept, on a uniform plan, in many places, through a series of thirty or forty years, thereby furnishing all the data for comparing several epidemic seasons with the non-epidemic ones that precede and follow, in a sufficient variety of places to avoid mere coincidences. Here, gentlemen, is legitimate and very important work for medical society organizations, that you will do well to remember after you have entered upon the active duties of your profession.

Diagnosis.—This form of general acute disease is readily distinguished from all the other members of the class, by the suddenness of its access, its moderate and brief period of pyrexia, and the pretty uniform association of these, with the marked and severe catarrhal or inflammatory symptoms manifested in the air passages.

Treatment.—As nothing is positively known concerning the efficient cause or causes of the disease under consideration, our indications for treatment must be founded solely upon the actual pathological conditions presented by the patient at the time he comes under the care of the physician, and the known tendencies of the disease. When the physician arrives at the bedside of the patient, the initial chilliness has ceased, and he finds a moderate general fever, accompanied by diminished eliminations from the skin and kidneys, severe headache, and an actively congested condition of the membrane lining the nostrils, trachea and bronchial tubes, clearly indicating the need of such remedial measures as will lessen the pyrexia, relieve the pains, actively promote all the important excretory functions, and diminish the congestion of the mucous membrane of the respiratory passages. While these four objects or indications for immediate treatment are plainly presented by the existing pathological conditions of the patient, you must remember the known tendency of the

disease to undue debility, or impairment of the nervous and muscular functions, and the frequent supervention of capillary bronchitis, lobular pneumonia and pleurisy, as important complications. The former should caution us against resorting to measures for subduing the pyrexia, of too actively sedative or depletive character, and the latter should keep us alert or watchful for the earliest symptoms that may indicate their existence, that prompt measures may be adopted for their relief. If you thus comprehend definitely the special objects to be accomplished by therapeutic agencies, you will readily select from the ample stores of the materia medica a variety of agents more or less accurately adapted to accomplish your purposes. In my own practice I have found the following outline of treatment more satisfactory in its results than any other. When called during the first or second day to cases of ordinary severity, I have generally ordered from four to six powders, composed of Dover's powder and nitrate of potassa, each five decigrams (gr. viii), and calomel one decigram (gr. iss), one to be taken every four hours. Also the following:

℞	Potassii Bromidi	20 gm.	ʒv
	Syrupi Scillæ Compositi	45 c. c.	f℥iss
	Syrupi Ipecacuanhæ	15 c. c.	f℥ss
	Tincturæ Opii Camphoratis,	60 c. c.	f℥ii

Mix, and give four cubic centimetres, or one ordinary teaspoonful, mixed with a tablespoonful of water half way between the powders. If the attack is severe, the pulse active and moderately firm under pressure, and the temperature under the tongue 39° C (102° to 103° F.) or higher. I add to the formulæ just given from four to six cubic centimetres (ʒi to ʒiss) of the tincture of veratrum viride, and bathe the head, face and hands, and sometimes the whole cutaneous surface, frequently with slightly warm water. The continuance of these remedial measures for twenty-four hours, usually relieves the severe cephalalgia and restlessness, reduces the temperature, and develops a pretty free action of the skin and kidneys, with less cough and tightness in the chest. I now omit the further use of the powders, and follow them by a laxative sufficient to procure from one to three intestinal evacuations. The liquid mixture, however, may be continued in such doses as the stomach will bear without nausea, so long as the cough and catarrhal symptoms continue troublesome to the patient. After the bowels have been moved, I have not generally found it necessary to give, in addition to the anodyne and expectorant mixture just named, anything more than from two to three decigrams (gr. iii to v) of sulphate of quinia each morning and evening, and a fair amount of plain food. Patients have generally convalesced in from three to five days, and have rarely presented any of the more serious pulmonary complications. In some instances, however, mostly in persons beyond the middle period of life, there has appeared after the second day such a degree of general weakness, that I have substituted in place of the mixture containing squills, ipecac, etc., a combination of syrup of senega, fluid extract of asclepias tuberosa, and camphorated tincture of opium, equal quantities of each, of which 4 cubic centimetres, or a teaspoonful was given every four hours, alternately, with one to two decigrams (gr. iss to iii) of sulphate of quinia in solution with aromatic sulphuric acid 0.6 cubic centimetres (10 minims).

Many mild cases have been apparently cut short or aborted by giving at night a single powder containing from four to six decigrams (gr. vi to x) of Dover's powder, the same quantity of sulphate of quinia, and two to three decigrams (gr. iii to v) of calomel, following it by a laxative in the morning

and 2 decigrams (gr. iii) of quinia two or three times a day for three or four subsequent days.

It is probable that the same results would be obtained by giving one fair diaphoretic dose of pilocarpin in the evening and following it with moderate doses of quinia three times a day until the convalescence was well established.

All patients should be required to take much rest, plain, but nutritious food, and good air, during the period of convalescence, and until their strength is well restored. Such cases as present important inflammatory complications in the pulmonary or other internal organs, must be treated on the same principles that govern the treatment of such inflammations under other circumstances.

DENGUE, OR BREAK-BONE FEVER.

History.—The acute general febrile disease described by most recent writers, under the name of *Dengue*, has been recognized as a distinct variety of fever only in modern times. It is probable, however, that epidemics of this disease have occurred at longer or shorter intervals, from a remote period of human history.

Some of them have been described under the names of miliary fever, break-bone fever, scarlatina rheumatica, dandy-fever, etc. The word *Dengue*, adopted by most recent writers, appears to have no special meaning; and is supposed to have been derived from the fanciful name "*dandy*," which had been popularly applied to the fever in some places on account of a peculiarly stiff manner exhibited by patients in attempting to walk. Like the influenza which I have just been discussing, dengue seldom prevails except in an epidemic form, and then almost always in warm climates embraced in the tropical, and southern half of the temperate zone. It was described by Dr. Rush as prevailing in Philadelphia in 1780, under the name of break-bone fever. It has frequently prevailed extensively throughout the East and West India Islands; in the southern part of Asia, Egypt, along the borders of the Mediterranean sea, and the southern half of our own country. The most noted epidemics of which we have full and accurate histories occurred in the Southern States in 1828 and 1850. The first was fully described by that distinguished scholar and eminent medical teacher, Dr. S. H. Dickson, then of Charleston, S. C., and the second by Drs. Dickson and Wragg, of Charleston, Dr. H. F. Campbell, of Augusta, Ga., and Dr. E. D. Fenner, of New Orleans. You can find a pretty full and interesting abstract of the views of these respective writers in the report on Practical Medicine to the American Medical Association in 1851, by Dr. Austin Flint, chairman of the committee, and in the paper appended to that report.*

Since the notable epidemic of 1850, the disease has repeatedly prevailed over more limited sections of country, chiefly in the West Indies and in the States bordering on the Atlantic and Gulf coasts, but sometimes as far north as the Ohio river. It not only prevails chiefly in warm climates, but also in the warm season of the year. It appears that its prevalence is favored by the same circumstances that favor the development of malarious or periodical fevers ; and several writers have noted the fact that it has often, either immediately preceded or followed an epidemic of yellow fever.

When the disease prevails in any community it generally attacks large

* See Transactions of the American Medical Association, Vol. 4, from p. 173 to 225, 1851.

numbers in proportion to the population, and so nearly simultaneously, that all must have been influenced by a common cause. The entire duration of the epidemic in Charleston, S. C. in August and September, 1850, was about six weeks. During the first four of these weeks, not less than seven-tenths of the entire population of the city were attacked, and Dr. Wragg estimates that more than 10,000 were sick at one time. This would be one-fourth of the whole population. It appears to attack indiscriminately all ages and both sexes. Perhaps the colored part of the population was less susceptible than the white.

Symptoms and Progress.—In some cases the commencement of active febrile symptoms, is preceded for one or two days by some obscure feelings of indisposition, as general lassitude, dull pains in various parts of the body, sensitiveness to cold or heat, and depression of mind.

But in the larger proportion of cases the attack is abrupt, and attended with chilliness, but not a full chill ; severe pains in the head, back and joints, especially those of the extremities ; intolerance of light and sound; skin hot and dry, face flushed, and tongue coated with a white fur. In a few hours the fever reaches its climax, when the face and head feel hot and excessively painful; the articular pains change rapidly from one joint to another, not omitting the smaller joints of the fingers and toes; the pulse firm and frequent; great restlessness, and sometimes severe vomiting of bilious matter, the bowels being generally inactive. This grade of active fever usually continues from two to four days, when a marked remission supervenes, during which all the more severe symptoms subside, leaving only slight acceleration of pulse, and some stiffness and soreness in the muscles of the lower extremities.

This remission may last from twelve hours to two days, when nearly all the active febrile symptoms return, but with a little less severity than at first. The joints, however, become more red and swollen, and in almost all cases an eruption appears on the skin. It most frequently begins in the palms of the hands and soles of the feet, as an exanthematous eruption, and from those parts extends over the whole body, accompanied by much heat and itching, which added to the pains in the joints and muscular soreness, causes much restlessness and loss of sleep. The character of the eruption varies much, in some cases resembling erythema, in others roseola, and in others lichen. It also varies much in amount, being in some cases only slight or altogether absent. It varies also in the time of its appearance, being sometimes manifested before the remission instead of coincident with the second access or relapse, as some writers have styled it. The second paroxysm of fever usually continues three days, but in some cases ends in forty-eight hours; while in others it has been protracted to four or five days. It pretty uniformly ends with a critical evacuation. This generally consists of a free diaphoresis, but sometimes takes the form of copious renal or intestinal evacuations. You will see that the whole course of the disease from its access to its final termination occupies from five to nine days. It thus varies much in its duration and still more in the severity of its symptoms ; many cases being so mild as not to require the attendance of a physician, while others are accompanied by the most intense suffering and followed by such a degree of weakness as to require several weeks to regain the usual health and strength.

Prognosis.—This disease is rarely if ever fatal in adult life, and probably not in children, unless it becomes complicated with convulsions or cholera morbus. It is remarkable for the rapidity of its spread; the large numbers attacked; the brief duration of its prevalence, and the almost entire absence of fatality.

Erysipelas, purpura, and hæmorrhages, have been observed as complications in a few instances. Pregnant women attacked with the disease are very liable to miscarry. Relapses of the disease are not uncommon, and all severe cases are apt to be followed by a slow and tedious convalescence.

Etiology.—Of the nature or identity of the cause or causes of dengue nothing is positively known. Its appearance usually in very warm, dry seasons; the suddenness and rapidity with which it attacks a large part of the population of a city or district of country; and the brief period of its prevalence as an epidemic, are circumstances that could hardly coexist in regard to any disease unless it was produced by some modifications in the condition or composition of the atmosphere. Dr. E. D. Fenner, of New Orleans, who had good opportunities for studying the disease, evidently regarded it as only a modification of the ordinary malarious or periodical fevers, endemic throughout the Southern States. From the close similarity of circumstances relating to season of the year, geographical limits of prevalence, rapid spread without personal contact, and double febrile course, separated by an intermission, more or less complete, we would be justified in assigning the disease a place intermediate between the malarious remittent and the yellow fever, and claiming as its cause some atmospheric agency similar in kind, but less virulent in its effects, than that which gives rise to yellow fever.

Diagnosis.—As I have already intimated to you, Dr. E. D. Fenner regarded the disease called *dengue* as simply a modification of the ordinary endemic malarious fevers of warm climates. He adduces many and plausible reasons in favor of this view in the paper appended to the report of the committee on Practical Medicine, published in the Transactions of the American Medical Association for 1851, to which I have before alluded. If we consider, however, only its clinical history or symptoms and progress, we should distinguish it from the intermittent and remittent types of fever, by the less marked chill at the access; by the continuance of the febrile exacerbation for two or three days instead of a daily intermission or remission; by the one long intermission and a second exacerbation of equal length with the first, accompanied by its swollen joints and cutaneous eruptions. From relapsing fever, which in some respects it strongly resembles, it is distinguished by the pain and swelling of the joints; the peculiar stiffness and soreness of the muscles; the eruptions on the surface; the shorter course of the fever; and the simultaneousness of its attacks on large numbers in a given population. The same symptoms and facts in its history, together with its almost uniform tendency to recovery, equally distinguish it from the epidemic form of yellow fever.

Treatment.—The epidemics of this disease, that occurred from 1824 to 1828, and from 1847 to 1850, developed so suddenly, and the fever and pains were so intense, that most of the earlier cases were treated with the active depletive and evacuant measures then so generally adopted in the treatment of all acute diseases. Blood-letting, emetics, cathartics, anodynes, calomel, and quinine, were all freely used, and each had their zealous advocates, until it came to be fully understood that the disease, when left entirely to itself, almost uniformly terminated in full convalescence in from five to nine days.

Since the general recognition of this important fact, the treatment pursued by far the larger number of American practitioners is very largely expectant, consisting in rest, light food, anodynes to allay pain and restlessness, diaphoretics to favor critical evacuations; and during convalescence mild tonics and more nourishment. From the well-known efficacy

of salicylic acid in relieving rheumatic pains when associated with active pyrexia or high temperature of the body, especially when used conjointly with soda and diaphoretics, I should expect much benefit from its use in the active stage of the more severe cases of *dengue*. In such cases I would give three decigrams (gr. v) of calomel, to be followed in five or six hours by a saline laxative, and the following formula:

℞	Acidi Salicylici	15 gms.	ʒiv.
	Sodii Bicarbonatis	10 "	ʒiiss.
	Glycerinæ	30 c. c.	f ʒi.
	Tincturæ Phytolaccæ	75 "	f ʒiiss.
	Tincturæ Opii Camphoratis,	45 "	f ʒiss.

Mix, and give four cubic centimetres, or an ordinary teaspoonful every two, three or four hours, mixed with a little additional water when taken. This should be discontinued as soon as the active febrile symptoms, together with the severe pains and restlessness, cease. During the intermission between the first and second exacerbations of fever, and also during the final convalescence, the patient should avoid active physical and mental exercise, live on plain but nutritious food, and take from one to two decigrams (gr. ii to iii) of sulphate quiniæ three times a day. Of course, the doses of medicines I have mentioned are such as are proper for adult patients. For children the quantity must be lessened in proportion to their age. This, gentlemen, completes the brief account I have deemed desirable to give concerning a group of general fevers characterized by active exaltation of the properties and general processes taking place in the human system, but brief in duration, tending very uniformly to recovery, and depending for their production mostly upon atmospheric causes that are also transient or incapable of continuous propagation.

LECTURE X.

Typhoid Fever—History, Causes, Symptoms, Diagnosis, Prognosis, Special Pathology, Pathological Anatomy and Treatment.

GENTLEMEN: I must now call your attention to one of the most important of all the acute general diseases. It is most important, from the wide extent of its prevalence, being liable to occur wherever human beings aggregate together in civilized and stationary communities, from its protracted duration, and from the high ratio of mortality that results from it.

Typhoid fever has been recognized and described under various names, from the remotest periods of medical history. Until the days of M. Louis, of Paris, it had not been separated from the typhus fever, but had, with the latter, been described under the names of synochus, typhus mitior, and abdominal typhus.

In later times it has been called typhoid fever, enteric fever, dothinenteritis, common continued fever, pythogenic fever, and sometimes autumnal bilious fever. In Germany and some other parts of Europe it is still

frequently called abdominal typhus, but in this country it is very generally designated as typhoid or enteric fever. The latter name was applied to the disease by Dr. George B. Wood, but is objectionable, as implying a dependence of the fever on the intestinal lesions, and I shall adopt the former as the one most generally familiar to the profession in this country, and least likely to suggest erroneous pathological ideas. As I have already intimated, the prevalence of typhoid fever is not limited to any soils, climates, topographical conditions, seasons of the year or classes of people. It occasionally attacks a sufficient number of people in a given community in a particular season to be called an epidemic, but its prevalence is generally strictly endemic and continuous to a greater or less extent throughout the year.

I do not mean by these general expressions that this variety of fever prevails *equally* at all seasons of the year, or to the same extent in all localities. On the contrary, while in any given community cases of the disease may be met with every month of the year, yet as a general rule, it is much more prevalent during the last half of summer, autumn and winter than in the remaining seasons. And in relation to localities, it prevails more in cities than rural districts; and much more in districts and countries long peopled than in those recently settled by civilized man. The latter remark is more particularly applicable to such newly settled countries as present a soil and climate favorable for the development of the group of fevers styled periodical or malarious. Such was the condition of a large part of our own country.

The whole of this great interior valley, extending from Lake Superior to the Gulf of Mexico, the territory bordering on the gulf from the Rio Grande river to Key West, together with the Atlantic and Pacific slopes, presented at the time of their settlement by civilized races of men, a richness of alluvial or tertiary deposits, containing decomposable vegetable matter in such quantity that malarial or periodical fevers took the precedence of all other endemic febrile affections, and typhoid fever was hardly recognized as having an existence during the first two generations. But as the settlements grew older, the population more dense, and the vegetable matter in the soil lessened by cultivation, cases of typhoid fever began to attract attention, and from year to year became relatively more prevalent, until they have become familiar in every part of the country.*

Etiology.—Perhaps there is no topic embraced in the domain of medical literature concerning which we have on record a greater diversity of opinions, or more directly contradictory statements by authors apparently equally entitled to our confidence, than concerning the efficient cause or causes of typhoid fever. Some few claim with much positiveness that the disease spreads by contagion emanating from the body of the sick, sufficient to infect the surrounding atmosphere. A much greater number deny this, and assert that the disease is never communicable directly from one individual to another by personal contagion. Until a comparatively recent period much the larger number of writers and eminent observers simply claimed that the efficient cause of typhoid fever was a poison, or class of poisons, produced by accumulations of animal matter or excretions, either in the confined air of dwellings and other buildings, or in moist soils, and capable of impregnating both air and water. The supposed poison or poisons thus engendered were called idio-miasms, to dis-

* For a more detailed account of the development and progress of typhoid and typhus fevers, the student can consult the second volume of Dr. Daniel Drake's work on the Principal Diseases of the Interior Valley of North America, from page 361 to 440.

tinguish them from the poisonous products of vegetable decomposition called koino-miasms, or more commonly, malaria. But since the application of the microscope to medical investigations, and the discovery of various disease-producing germs, it has been assumed by nearly all our recent writers that the essential cause of typhoid fever is an organic germ of specific character, propagated chiefly, if not exclusively, from the intestinal evacuations of those sick with the disease. It is not claimed that such intestinal evacuations are capable of producing the disease when freshly voided, or of infecting the atmosphere around the patient so as to endanger nurses or friends in attendance on the sick; but that they contain immature germs, capable, under given circumstances, of further development, when they become capable of inducing the disease in others by impregnating either the air of dwellings, or the drinking water, or even milk from dairies.

And we are assured by these authors that the disease never originates in any house or locality until these specific germs have been introduced from some previous case or cases.

They contend that the poison never originates *de novo*, from any amount or kind of decomposing animal excrements unless the specific typhoid germ be present.*

It is my duty, however, to caution you against receiving such positive assertions with entire confidence; and for the simple reason that an impartial examination of all the more carefully observed and recorded facts, do not afford sufficient positive evidence of their correctness. Indeed, gentlemen, we have no direct or positive evidence that this much talked of "typhoid *germ*" has any existence except in the human imagination; for no one has yet succeeded in isolating, and satisfactorily identifying it, either with microscope or chemical apparatus. I do not claim that such actual identification is necessary before we are justified in admitting the existence of a poison or germ of some kind. For when certain effects are found uniformly to follow the coincidence of certain circumstances or conditions, we may logically infer that such circumstances or conditions give rise to the alleged effects, either directly by their own action, or indirectly by the evolution of some agent of peculiar or specific qualities. To make such inference legitimate, however, the supposed conditions must always be found either coincident with, or directly antecedent to, the alleged effects. Such coincidence between the local or recognizable conditions and the prevalence of certain diseases, such as intermittent, remittent and yellow fevers, has been traced with a reasonable degree of uniformity; and we may feel fully convinced that the coincident circumstances actually evolve, or give origin to, the efficient cause of these fevers. We may go so far as to give this cause a name, calling it a miasm, or malaria, and study the laws that appear to govern its diffnsion.

But typhoid fever has not been found to originate with uniformity from the juxtaposition of any special conditions of the air or earth or seasons. On the contrary, cases of the disease are met with, as I have already stated, at all seasons of the year, in all climatic zones, and among all varieties of people. And it is this very great diversity of the conditions under which typhoid fever has been observed, that renders it so difficult to trace it to any one specific germ as its essential cause. It is true, that many cases have been traced directly to the influence of foul air from cesspools, sewers and waste-pipes; and others to water from wells, cisterns and reservoirs, which had been contaminated by excretions. But in

* See A Treatise on the Practice of Medicine, by Roberts Bartholow, M. D., etc., p. 689; also Liebermeister, in Ziemssen's Cyclopædia

only a few of these had it been positively ascertained that the dejections from typhoid fever patients had constituted any part of the contaminating material. One of the cases that has been regarded as affording the strongest proof of the propagation of the disease from germs in the evacuations of a person affected by the fever, was reported by Dr. Austin Flint, first in the American Journal of Medical Sciences in 1845, subsequently in his interesting volume of "Clinical Reports on Continued Fever" in 1852, and still later in the several editions of his valuable work on the Practice of Medicine.* This case occurred in 1843, in a small village called North Boston, in the western part of New York State. A traveler from some one of the New England States, was taken sick on his journey westward, and on arriving at the tavern in this little village he was unable to go further, and after remaining a few days he died. The history of the case obtained by the physicians who saw it, rendered it reasonably certain that it was one of typhoid fever. Previous to the arrival of the stranger, this variety of fever had never been recognized in the neighborhood.

In twenty-three days after the arrival of the stranger, members of the family of the tavern-keeper became sick with the same disease. Cases soon followed in the other families living in close proximity to the tavern, and in one month forty-three cases had occurred, constituting about one-half of the entire population of the village, and ten of those attacked died. The only family in this little community that entirely escaped the disease was one the members of which had no communication with the tavern or its inmates on account of personal enmity. The history of this little isolated outbreak of typhoid fever, so directly following the introduction of the disease by the stranger from New England, was first published by the distinguished author I have named, as furnishing positive proof of the contagiousness of the disease, he then supposing that it had spread by personal communication from one individual to another. Subsequent investigations, however, pretty clearly showed that all who had been attacked had been drinking water from the well belonging to the tavern, and that the *privy*, also used in common, was in close proximity to the well. The addition of these facts led to the *supposition* that the intestinal evacuations of the sick stranger, containing the *typhoid germs*, were thrown into the privy, from whence, after due development, they percolated into the well and contaminated the drinking water for the neighborhood. As this prevalence of typhoid fever in North Boston in 1843, is acknowledged to be one affording the strongest proof of the propagation of the disease by means of germs originating in the evacuations of typhoid fever patients, please note carefully the essential facts accompanying it. They are, first, the arrival of a stranger, sick with the fever, in a small settlement previously entirely exempt from the disease. Second, twenty-three days later the disease attacked members of the family in the house where the stranger had been entertained, and soon spread to all the families in the immediate vicinity, except one. Third, there was a *well* and a *privy* in close proximity to each other, which were used in common by all the families in which the disease made its appearance. Fourth, it is supposed that the evacuations of the sick stranger were thrown into the privy. Fifth, all the families using water from the well near the privy had more or less of the fever, while the only family among them that did not use the water from that well escaped.

These are the essential coincident facts. The inferences which have been drawn from them are that the evacuations from the sick stranger,

*See a Treatise on the Principles and Practice of Medicine, etc. By Austin Flint M. D., etc. Fifth Edition, p. 962.

containing fever germs, were thrown into the privy; that the germs there finding a favorable medium, developed to the stage of activity, and then percolated into the well in sufficient quantity to contaminate the water and communicate the disease to those using it. You will see that the only part of these inferences which are actually justified by the facts, are the deposit of the stranger's evacuations in the privy and the subsequent sickness of those who used water from the well near by it. All that is said about germs is mere assumption, there having been no investigation made for their discovery, and of course none discovered either in the evacuations of the sick stranger or in the water of the well. So far as the ascertained facts show, the coming and death of the stranger may have been a mere coincidence, without having had any influence whatever in producing the subsequent outbreak of fever in the place. It would be just as legitimate and more nearly in consonance with other well-known facts, to suppose that the contents of the privy had been accumulating for two, three or more years, and each year percolating into and saturating more and more the surrounding soil, until in this particular season the percolations had reached the adjacent well in sufficient quantity to contaminate the water, as to suppose the mere addition of a few evacuations from this unfortunate stranger had done all the mischief. The question whether the coming of the sick stranger was in this and other parallel cases a mere coincident, or a cause of the subsequent outbreak of fever, can be properly answered only by a close adherence to the acknowledged rules of evidence, or the well-known principles of inductive reasoning. If on examining the recorded histories of the various outbreaks of typhoid fever during the last half century, we should find that in eight out of every ten of such outbreaks one or more cases of the disease had been imported or received into each locality at a reasonable time prior to the occurrence of the first cases, we would be justified in claiming that the efficient cause was in some way furnished by the cases arriving before the local development of the disease.

On the other hand, if the recorded histories show no positive proof of the arrival of either patients or their excretions prior to the local development of the disease in nine out of every ten of the outbreaks on record, then certainly the proof of such preceding importation in the tenth case can be properly regarded only as an accidental coincident. If we examine the collection of facts concerning the development and progress of the typhoid outbreaks in this country, from the appearance of the "spotted fever" epidemic at Medfield, in the Connecticut River Valley in 1806, to 1850, contained in the second volume of the valuable work on the Principal Diseases of the Interior Valley of North America, by Dr. Daniel Drake, we shall find these occurring at different times, in every variety of locality, from the coast of New England to the Mississippi river, and from the Great Lakes to the gulf; in cities and sparsely populated rural districts; among all classes of the people, and at all seasons of the year.

And certainly not in more than one instance out of ten, is there any mention of evidence that the outbreaks were preceded by cases of the disease arriving from other localities. The brief histories of Dr. Drake are well supplemented by reports on the topography and epidemics of different States, contained in the annual volumes of transactions of the American Medical Association, from 1844 to 1870.

Nearly all of these reports embrace accounts of the prevalence of typhoid fever in different parts of the country, mostly from intelligent members of the profession, who described what came directly under their

own observation; and many of them in localities where the disease had never before prevailed, and where, from the sparseness of the population and comparative isolation, the questions of spontaneous origin or of importation of germs, could be investigated much more successfully than in large cities, or the older and more densely populated rural districts of European countries. In examining these, together with the reports on practical medicine and hygiene in the same volumes, we find but few instances in which the first development of the fever was traceable to any possible connection with previous cases, either in the same locality or from other places. In a much larger number of instances, the question of sources from which some infection might have been received was not critically investigated, but none were detected or mentioned. While in a considerable number of instances, the origin of the disease spontaneously, from local causes free from the prior introduction of any cases or infectious germs from without, was so clearly established as to leave no reasonable doubt in the mind of any impartial observer.*

In addition to the instances of spontaneous or local origin of this variety of fever given in the volumes to which we have alluded, a score of other instances could be collected from the pages of our periodical literature, where it occurred in jails, manufacturing establishments, boarding schools and private houses, under circumstances precluding all probability of its having had any connection with preceding cases or infection introduced from without. Two such instances have come under my own observation; and during an active practice of more than forty years I have met with many single cases of well-marked typhoid fever: some in the country, others in the city, which passed through the regular ordinary course of the disease, each surrounded by family and friends; the urinary and fœcal discharges being promptly removed, and without disinfection thrown directly into the common privy-vault, without their having been either preceded or followed by any other cases on the same premises during a period of at least fifteen years. In many of these cases the patients had not been off from their own premises for many months, neither had any other case of that disease been on the premises for years previous. For thirty years past I have been an active member of the medical staff of the Mercy Hospital in this city. A part of the medical wards have been under my care all that period of time, and typhoid fever has been one of the most common forms of disease under treatment. The patients laboring under that fever have been received into the same wards with other patients, and their evacuations disposed of in the same manner; yet, in not a single instance has the disease been communicated to the other patients. It is true that the wards have been kept clean and well ventilated, but no more so for typhoid fever patients than for all others. My experience in this respect is in direct accordance with that of many of the most experienced and careful observers in this country.†

From the foregoing facts and references you will see that the positive assertions of Dr. Budd,‡ Dr. Liebermeister,‖ and others, to the effect that typhoid fever never originated in any person or place without the pres-

* See an account of the typhoid fever, etc., that prevailed on Cape Ann in 1833, by Joseph Reynolds, M. D., of Gloucester, Mass., in Transactions of the Amer. Med. Association, Vol. III, p. 137, 1850. Also case related by Dr. Hartz, on p. 229.

See Transactions of the same Association, Vol. V, pp. 308-334—Vol. VI, p. 356. Also Vol. 13, 1860, pp. 232-234.

† Dr. George B. Wood, of Philadelphia, in the fifth edition of his Treatise on the Practice of Medicine, page 351, uses the following emphatic language: "But against the opinion of its ordinary contagiousness is the fact, that it is constantly springing up in ISOLATED cases, without any *possible communication*, and that, in such instances, it is very seldom, if ever, imparted to others."

‡ See Flint's Practice, page 963.

‖ See Ziemssen's Cyclopædia of Practice, Vol. I. from page 50 to 54 inclusive.

ence of the specific fever germs furnished by the excretions of those suffering from the same general fever, are not sustained by the facts connected with the prevalence of that disease in this country. If you scan the statements of writers and observers more closely, you will find them all freely admitting that there is no evidence of infection or communication of the disease from any kind of contact with the excretions of typhoid fever patients when freshly voided. It is only when such excretions have been kept in privy vaults, moist soils, or other places favorable for further decomposition, that the organic germs they are supposed to contain become developed into an active infection, capable of communicating the disease either by inhalation with the air, or by suspension in drinking water, etc. Direct microscopic examinations of the intestinal follicles, mesenteric glands and spleen, of typhoid fever cases, have been made by Von Recklinghausen, Klein, Fischel, Eberth, Sokoloff and Klebs, resulting in the discovery of micrococci, bacilli, or bacteria, in about one-third of the number of cases examined; but nothing was discovered tending to show that these organic bodies had any agency in producing the fever from which the patients had died. There is, therefore, no proof of the existence of a special fever germ, or specific organic poison, either in the fresh evacuations of typhoid fever patients, or in the diseased structures of those who have died from the gravity of the fever. Consequently the very general assumption that the essential cause of typhoid fever is a specific organic germ, capable of being propagated in the evacuations from those sick with the disease, must be regarded at present as a mere theoretical dogma.

A careful adherence to well ascertained facts concerning the etiology of the fever under consideration will require us to accept the three following propositions: First, that cases of typhoid fever originate and multiply in dwellings or buildings of any kind, in which from either overcrowding the number of the occupants or the neglect of ventilation and cleanliness, the air, furniture and walls become strongly impregnated with the organic matter exhaled from the skin and lungs of the occupants.*

So true is this that the annual returns of mortality statistics for every densely populated city in our country show the highest ratio of mortality from this disease, in the crowded tenement houses, manufacturing establishments, and small dwellings of the poor.

Second, that the more the soil of any given locality becomes impregnated with the intestinal and urinary excretions by the progressive increase of the density of the population, provided the two conditions of drainage and water supply remain the same, the more frequent and severe will be the cases of typhoid fever occurring among the inhabitants of such locality.

This proposition has been so fully illustrated by the progress of settlement and increase of population in our country that its truth is established beyond controversy. In addition to this, the great number of outbreaks of the fever, which have been traced directly to the use of water impregnated with the percolations through the soil from privies, cesspools, house drains, etc., leave no room for doubt as to the influence of this agency in producing the disease.†

* For a most interesting and valuable discussion of the amount of organic matter escaping from the lungs and skin in a given time, and the readiness with which the air of unventilated rooms may become contaminated from this source, see the Report on Public Hygiene by the late Dr. Joseph M. Smith, of New York, in the Transactions of the American Medical Association, Vol. III p. 223, 1850.

† An important fact bearing upon this subject was stated by Dr. L. S. McMurtry, of Danville, Kentucky, in an address delivered before the Kentucky State Medical Society, in April, 1881, and published in the Medical News and Abstract for June, 1881. He says, "twenty years ago the dis-

Third, cases of genuine typhoid fever have occurred, and are still occurring occasionally, in almost every civilized community in persons who have had no traceable communication with previous cases of that disease, or with any of the recognized or even suspected sources of infection. I have met with many isolated cases occurring in members of families living in houses in which a case of the disease had not been known to occur for ten years previously, neither did any others follow for ten years after. Yet these individual cases were surrounded and nursed by their respective families, and their evacuations emptied into the ordinary water-closets belonging to the premises. Most of these cases appeared to originate from causes directly personal to the individuals affected, such as protracted mental depression and anxiety, excessive mental or physical work, and abrupt changes from active out-door occupations to passive in-door work. Assuming that typhoid fever is a specific disease, characterized by a definite course, and accompanied by special or peculiar pathological and anatomical changes, many writers have claimed that it must have a single specific and essential cause, and consequently that all other causes apparently influencing the prevalence of the disease were only predisposing agencies. Probably no fact is better established than that the disease under consideration generally originates from the use of air or water impregnated with some one or more of the products derived from the decomposition of organic matter. It does not follow, however, that such product of organic changes must necessarily be formed outside of the human body.

On the contrary, there are many facts that indicate the possibility of such modifications in the processes of disintegration of living structures as are capable of evolving septic or other poisonous material, which like all other products of tissue changes, are returned into the blood, where they are capable of acting on the general properties and inducing general febrile disturbances of the same character as when an organic poison is received from without. It is well known that some of the general acute diseases which ordinarily manifest no tendency to communicate from individual to individual by personal contagion, in some rare instances have manifested this disposition in the most decisive manner. Several instances are on record of this kind in relation to typhoid fever; which can be explained in no other way than by admitting that a disease ordinarily produced by causes received from without may also originate from similar, if not identical, causes developed from perverted molecular changes within the living body. That protracted mental depression and anxiety, coupled with deficiency of sleep, is capable of modifying all the properties and molecular movements concerned in the processes of nutrition, disintegration, and secretion must be admitted by all experienced observers.

So, too, protracted and severe physical labor, by which the waste of tissues is made to exceed the supply or repair, may not only cause tissues to become so deficient in tissue material as to derange or pervert the movements of atoms, and consequently cause the formation of morbid products; but may also cause the ordinary products of waste to accumulate in the blood faster than the excretory organs can eliminate them, until such accumulation becomes a cause of disturbance. Still more, may similar per-

ease (typhoid fever) prevailed in epidemic form throughout the villages and farming districts of this State almost every season with frightful severity. Now we rarely encounter typhoid fever except in isolated cases in which the disease was contracted elsewhere and brought home in the formative stage." The reasons for this change he gives as follows: "Formerly wells with free subsoil communication were the sources of drinking water; now cisterns are almost universal sources of water supply in Kentucky. The geological formation is admirably adapted to the construction of cisterns, and the cemented cisterns of this State are practically sealed bottles into which the water pours through filters."

versions of molecular movements in the processes of disintegration and elimination take place in those persons who in the early period of adult life change suddenly from active open air occupations in rural districts to the more confined indoor employments of our large cities.

Such persons seldom get sick during the first few weeks after they change residence, but more particularly after from four to six months. The tendency of typhoid fever to attack persons who had resided in Paris less than one year, much more frequently than older residents, was noticed by M. Louis; and the same tendency has been observed in many other cities since. During the whole of my residence here I have not failed to observe that an undue proportion of those young persons of both sexes who change their residence from the country to the city in the winter or spring have an attack of typhoid fever in the latter part of the following summer or autumn, and those who make the change in the autumn are more liable to have the fever in the following spring or early summer. Among the predisposing causes of this variety of fever are generally enumerated age and season of the year.

Statistics show that far the larger number of cases occur between the ages of 15 and 30 years, and in about an equal ratio in the sexes. The next period of life most amenable to attacks, is from 10 to 15, years, but no period of life is entirely exempt.

In regard to the influence of seasons of the year, it must be remarked that particular epidemics and certain strictly local outbreaks in particular houses or buildings, have occurred at all seasons of the year, yet it is certain that the ordinary endemic prevalence of the disease is much greater in the autumnal months, than in any other. Generally in this city the attacks are observed to commence being more frequent the last half of August, and to reach the climax of their frequency in October; then gradually declining through November and December, reaching nearly the minimum in January. In most years a slight increase takes place during the months of February and March, to be followed by a decline through April, and an actual minimum of prevalence through May and June. As a rule, a wet spring followed by a warm and dry summer is succeeded by an unusual pevalence of the disease in the autumn.*

But I have already occupied your attention on the subject of the etiology of this fever longer than I had intended. If, however, I have succeeded in impressing your minds with the importance of adhering to well-ascertained facts, and avoiding hasty and positive conclusions until all the facts have been ascertained, and each allowed its proper influence, the hour will have been spent profitably, both for yourselves, and the communities you are preparing to serve.

* The present year, 1881, presents some peculiarities The winter was protracted later than usual with a great excess of snow. The melting of the snow not only caused a full saturation of the soil, but unusual floods over a large part of the country during March and April. This was followed by entire dryness during May and June; and the latter part of the last named month, a a severe grade of typhoid fever began to prevail in many parts of the city, and has continued with but little abatement to the present time time, July 20th, 1881. The health department of the city reports 24 deaths from typhoid fever, and 3 from typho-malarial fever, in June, which is a very much greater mortality than usually takes place in that month from the same diseases. In June of the preceding year, 1880, the number of deaths from the same fevers was only 9.

LECTURE XI.

Typhoid Fever Continued—Symptoms, Diagnosis, Prognosis, Special Pathology, Pathological Anatomy, and Treatment.

GENTLEMEN: An unmixed case of typhoid fever presents four stages or periods of progress requiring the attention of the physician, namely, the prodromic, or forming stage, the stage of active progress, the stage of defervescence or decline, and the period of convalescence. Those who believe in the origin of the disease exclusively from a specific fever poison, speak also of a period of incubation, the length of which, however, is made to vary from five or seven days to three or four weeks. It is hardly necessary, after the statements made in my previous lecture concerning the causes of typhoid fever, that I should characterize the claim of a period of incubation as entirely hypothetical.

The forming stage varies in different cases from five to fifteen days, the average being about one week. The second, or active stage, usually extends from two to three weeks, and the third, or declining stage, from five to nine days, making the average duration of the disease from the beginning of the symptoms to the establishment of convalescence about four weeks, or three weeks from the time the patient takes his bed. I have seen cases terminate in two weeks, and I have seen others continue six, seven, and some even eight weeks, before convalescence was fairly established.

Symptoms.—The symptoms of the forming stage are chiefly feelings of languor, weariness, indisposition to mental or physical exercise, morbid sensations of heat and cold, indifference or loss of appetite, a mawkish or unpleasant taste in the mouth, especially in the morning after sleep, a numb and unsteady feeling in the head, especially on rising from the bed or chair, and in many instances a dull, steady pain in the head, back, and limbs. The expression of countenance is generally dull; the face sometimes flushed and at others a leaden paleness; lips dryer than natural, and tongue usually coated with a dull or dirty white covering over the middle and posterior part, but sometimes remaining clean and moist through the whole of this stage. The skin is generally dryer than natural, and increased one or two degrees above the natural temperature; the urinary secretion slightly diminished, and bowels often failing to move each day, though easily moved by laxatives, and sometimes loose. The foregoing symptoms usually commence so gradually that the patient finds it difficult, often, to specify the first day he began to feel unwell. They increase, however, from day to day, especially the dullness and aching in the head; the weariness and unsteadiness of gait in attempting to exercise; and in from five to seven days, as a general rule, the patient feels obliged to remain at rest or take to his bed, which marks the beginning of the second, or more active stage of the fever. It is rare that an unmixed case of typhoid fever is ushered in by an abrupt and well-marked chill, but it is very common during the latter part of the forming stage and the first two or three days of the active progress, for the patient to complain of coldness in undressing or in getting in or out of bed, and when questioned by the physician he often calls these momentary feelings of coldness, chills. Many patients during the forming stage interpret their dullness

and feelings of indisposition as indications of "biliousness," and consequently take active physic to correct it, without consulting a physician. Instead of affording relief, however, such evacuants generally operate more freely than usual, and almost invariably hasten the time the patient is obliged to take his bed, and cause a continued looseness of the bowels much earlier than would otherwise have occurred. It is generally at the beginning of the second stage, when the patient is no longer able to be out of bed, that your aid as physicians will be required. At that time, in addition to the symptoms already described, you will find the face more flushed; the lips more dry; the skin generally more dry and hot; more decided pains in the head, with the addition of dizziness on attempting to get up; some thirst, with more decided coating upon the tongue; repugnance to food; the mind more dull, with inclination to drowsiness, yet somewhat restless; urine scanty, and bowels inactive, except in cases in which active physic had been given in the forming stage. In such you will often find slight tympanites, with gurgling on pressure, and from three to five or six intestinal evacuations in the twenty-four hours, even on the first days of the patient's confinement to bed. The pulse usually ranges between 85 and 100 per minute, and the temperature in the axilla about 38° C. (100.5° F.) in the morning, and 39° C. (102.5° F.) in the evening. If not materially modified by treatment, the assemblage of symptoms just enumerated will continue, steadily becoming more pronounced from day to day, until at the end of the first week after confinement to the bed, the temperature has advanced to 39°.4 C. (103°F.) in the morning, and to 39°.9 C. or 40°.5 C. (104° F. or 105°F., in the evening. The patient will complain less of pains and restlessness, but appear more drowsy; the whole face more suffused with redness; less moisture in the mouth, and a strip over the middle of the tongue dry, and brownish color, while the tip and edges are red; mind often wandering, especially at night; pulse from 95 to 110, and more soft; respirations slightly increased in frequency, with harsh respiratory murmur, indicating dryness of the respiratory mucous membrane; more frequent intestinal discharges, generally reddish-brown and thin, though sometimes lighter, or ash-gray color; abdomen more convex and tympanitic; occasional epistaxes, or hemorrhage from the nose; and in some cases, small, slightly oval red spots appear about this time on the chest and abdomen. The pyrexia, or essential symptoms of the fever, are generally at the climax of intensity as the patient enters upon the second week of his confinement, and they continue with but little variation through that week. The mental dullness and delirium may increase some; the whole surface of the tongue appear more dry and brown; some sordes may appear on the exposed part of the teeth and edges of the lips; the abdomen more decidedly tympanitic, and intestinal discharges more frequent and more thin and brown, containing small white flakes, and sometimes small masses of mucus with specks of blood adherent to them; more rose-colored spots appear and disappear over the chest and abdomen; more frequent epistaxes, and more dry bronchial râles. The morning temperature during the whole of this second week is generally between 39° and 40° C. (102.5° and 104° F.), and the afternoon and evening temperature from one to two degrees higher.

The pulse may vary from 100 to 120 per minute, soft and weak; respirations from 18 to 22 per minute, with occasional cough, and imperfect inflation of the posterior, and lower part of the lungs. In cases tending towards a favorable termination, as the patient enters the third week of his confinement in bed, the disparity between the morning and evening,

temperature becomes greater, the former gradually declining to 37° or 38° C. (99° or 100.5° F.), while the latter, though more unsteady, will still often reach 40.5° C. (105° F.) During this third week the flush leaves the face; the lips cease to gather sordes; the mouth is less dry; the coating on the tongue breaks up, and the edges become moist; some moisture appears on the skin, especially in the mornings; the bronchial râles are less dry; the abdomen is less tympanitic, and the intestinal discharges less frequent, and sometimes quite natural; delirium ceases, and the periods of sleep are more perfect. At the end of this week, or during the first half of the fourth, the temperature returns permanently to the natural standard, the abdominal tympanites ceases, and convalescence is established. Such is the usual course of typhoid fever, when of average severity. Many cases run a milder course, and convalesce during the third week, while others are more severe, and do not reach a final convalescence until the end of the fourth, or even during the fifth week after the patient takes to his bed. But in all the cases, the important symptoms are the same in kind, only differing much in the degree of severity. When the fever is of that grave character, which tends inherently towards a fatal result, the symptoms are much the same as I have just described, until about the end of the second week, at which time the patient becomes more constantly delirious; muscular movements more unsteady and sometimes tremulous; hearing more dull; temperature higher; pulse more frequent and feeble; respirations shorter and more frequent, with increase of bronchial râles, and commencing dullness on percussion over the posterior part of the chest; whole mouth dry, coat flakes off from the surface of the tongue, leaving it red, dry, and often fissured, with difficulty of protrusion; abdomen more decidedly tympanitic and intestinal discharges very thin, reddish brown, offensive, and often mixed with some blood, varying from three to six or eight in the twenty-four hours. Near the end of the third week, in the most severe, and during the fourth in those a little less so, the patient becomes entirely prostrate or exhausted. His countenance becomes pale and haggard; his chin begins to drop, leaving his mouth open, except when strongly aroused; deglutition difficult; his skin relaxed and moistened with a clammy sweat; extremities cool and of a leaden hue; pulse very frequent and feeble; sphincters relaxed, permitting both urine and feces to be discharged involuntarily; or the urine to be retained until the bladder becomes overdistended, and then dribbles in the bed. When these signs of extreme exhaustion have supervened, the patient may linger one, two or three days, when death from asthenia supervenes; although, I have seen a few cases recover after all these more dangerous symptoms, had become well marked.

In a very few of the more dangerous cases of typhoid fever, instead of somnolency, stupor, muttering delirium and coma, the patient manifests a morbid vigilance that admits of no sleep either night or day. The expression of countenance is that of anxiety and apprehension; the pulse is small and very frequent, respirations hurried, the hands tremble, the skin is most of the time wet with perspiration, and yet the bodily temperature is high—from 40° to 41° C. (104.5° to 106° F.) These cases are always dangerous, as the nervous excitement and loss of sleep rapidly exhaust the strength of the patient.

Throughout the first and second stages of typhoid fever of all grades of severity, there is considerable thirst, but either indifference, or positive repugnance to food, with more or less impairment of all the special senses. Hearing, especially is so impaired during the second and third weeks, that

in some cases the patients appear quite deaf. Vision is less affected, yet somewhat impaired, as are also the senses of smell, taste and touch. Such, gentlemen, are the chief symptoms presented during the progress of typical or uncomplicated cases of typhoid fever. If I should leave you, however, with the impression that the forming stage and first week of confinement in all the cases of this disease corresponded in the symptoms with the detail just given, you would be very poorly prepared to appreciate the variations in different cases that you will certainly meet at the bedside of the sick. The untypical, or complicated cases of this fever may be arranged in three groups for convenience of description, namely, those cases presenting in the forming stage unusual symptoms of gastro-intestinal irritation; those accompanied by inflammatory action in the air-passages and pulmonary structures; and such as present at the beginning chills, with decided exacerbations of fever, so well marked as to resemble the early stage of a genuine remittent. Of those constituting the first group, I have seen some commence suddenly with all the phenomena of an ordinary attack of cholera morbus. After vomiting and purging severely from two to eight or ten hours, the former ceases, and the latter is reduced to simple diarrhœal discharges of a grayish, or turbid appearance, and a slow, febrile reaction takes place, causing the face to become flushed, the lips and mouth dry, the skin moderately hot, the mind and countenance dull, pulse small and increased in frequency, with considerable thirst and some drowsiness; and at the end of forty-eight hours, instead of convalescence, as is usually the case after a simple attack of ordinary cholera morbus, the patient presents all the phenomena belonging to the first part of the active stage of typhoid fever. I have seen a much larger number of cases commence with more or less active diarrhœa, without vomiting.

At first the discharges will be simply thin fecal matter, of light yellow or grayish color, accompanied by little or no pain, and not more than three or four in the day. Each day, however, they become more watery and frequent, the patient feels dull and weak, his lips are dry, appetite poor, mind listless, but he often continues to attend to his usual work for several days, but is finally compelled to take his bed, at which time you will find him with all the usual phenomena of the active stage of typhoid fever, except those pertaining to the alimentary canal will be unusually prominent. The cases belonging to this group, generally occur during the warmest part of summer, and appear to be modified in the forming stage by the causes that usually favor attacks of cholera morbus and ordinary summer diarrhœa. On the other hand, cases belonging to the second group of untypical attacks, are met with chiefly during the cold season of the year, more especially late in the autumn, and early in the spring, when there is much wet, with a predominance of cold. Every season some of these cases are met with, and are found by the physician, after the patient has taken to his bed, with the following history: For a period varying from three to six days, the patient had been unusually sensitive to impressions either of heat or cold, with many of the symptoms of catarrhal irritation of the air passages, such as dull pain through the temples, stuffing of the nostrils, slight soreness in the chest, with some cough, and some general soreness of the muscular structures on the back and extremities. The headache increased from day to day, the general feelings of lassitude and weariness became more marked, accompanied by more sense of heat and flushing of the face in the afternoon, and less feeling of ability to get up and go about in the morning. When the physician is called he finds the patient presenting the general symptoms I have mentioned, which he is

assured have all come from a "bad cold." On close examination, however, he finds more dullness of expression, more general dryness of the skin, flush of the face, coating of the tongue; a quicker, softer pulse; and higher temperature than usually accompanies an ordinary cold. Examination of the chest and air passages shows evidence of a congested and rather dry condition of the nasal and bronchial mucous membrane, with occasional harsh cough. The urine is less than natural, and the bowels quiet unless they have been disturbed by physic, in which case they will have exhibited a tendency to looseness.

You will perceive that these symptoms differ from those of an ordinary cold by presenting a steadily increasing temperature, and dryness of the air passages, at a time when the feverishness of a catarrhal attack should have disappeared, and the secretion from the mucous membrane be free and more or less opaque. Yet this fact is often overlooked, and the patient treated for a catarrhal attack or a sub-acute bronchitis, until another week has passed, when the typhoid symptoms become so prominent as to compel a recognition. This group of cases are not only complicated from the beginning by a low grade of inflammation in the respiratory mucous membranes, but a limited area of pneumonia is also very apt to supervene towards the end of the first or during the second week after the patient takes to his bed. You should remember this fact, and pay special attention to the physical signs elicited by an examination of the chest from day to day, for the pneumonic inflammation in many of these cases is not accompanied by the ordinary bloody expectoration, nor by so much pain as to attract the attention of patients. The third group of untypical cases, embracing those commencing with distinct chills and daily exacerbations of fever, are very numerous throughout the whole interior valley of this continent, from the great lakes to the Mexican Gulf, though becoming gradually less so from year to year. If you examine the facts collected by Dr. Daniel Drake, and those given in the various reports contained in the earlier volumes of Transactions of the American Medical Association, to which I referred in the lecture of yesterday, you will find much the larger number of the cases referred to described as commencing with a chill and followed, for the first two or three days, by well-marked exacerbations and remissions.

The same phenomena accompanied the development of three out of every four cases of typhoid fever coming under my observation during the first ten years of my residence in this city, namely, from 1849 to 1860. This fact led many of the older practitioners then living in the city, who had been accustomed to meet only genuine intermittents and remittents during an earlier period in the settlement of this part of the country, to persistently deny the existence of any cases of real typhoid fever here. They claimed that all such cases as I have included in this group, were true malarious or periodical fevers, with a tendency to "run into a typhoid condition." And I have known many instances in which the attending physician repeated and increased his doses of quinine to "break up," or abort, the fever, until Liebermeister and all his followers were fairly outdone in the quantities of the anti-periodic (or, in more modern phrase, anti-pyretic,) given to the patient within a limited time. Nevertheless, the cases of fever continued their usual course, each day bringing the typhoid phenomena more prominent, until some of them proved fatal, and post mortem examinations showed all the characteristic intestinal and other lesions as perfect as in any cases ever described by M. Louis in Paris. Although this variety of cases is relatively much less frequent than thirty or forty years since, they are still more or less prevalent every

year, especially during the latter part of summer and autumn. And practitioners are still frequently deceived as to their nature when first called to attend them. It is not three weeks since I was called to see a case in consultation, in the southern part of the city, which at the time of my visit presented all the characteristics of a well-marked case of enteric typhoid fever about the middle of the second week of its progress. Yet the patient had suffered from so decided a chill and exacerbation of fever, regularly each day for the first three days of sickness, that the attending physician felt compelled to regard it as a genuine malarious fever, and to commence the treatment in accordance with that supposition. To recognize the true character of these cases in the beginning, requires the close and patient attention of the physician to the entire series of symptoms presented by the patient during the first forty-eight hours, and the preceding forming stage. If such attention is given, it will be observed that though the initial chill is well marked, the temperature during the hot stage neither rises so rapidly nor attains so high a figure on the thermometer, as in the hot stage of a remittent fever. It is not accompanied by the same degree of active thirst, restlessness, epigastric distress or vomiting, as at the climax of the paroxysm in the latter. Neither is the decline of the paroxysm so rapid, nor does the temperature of the patient return so near to the natural standard during the remission; and when there is a coat on the tongue, it is much thicker towards the back part and along the median line, than at the beginning of uncomplicated cases of periodical fever. If to these we add the greater dullness of expression, and less activity of thought and speech, we shall seldom fail to recognize the true typhoid character of these cases as soon as they come under our care. From the detailed description I have now given you of the different stages and varieties of typhoid fever, drawn directly from clinical observation at the bedside, you will not fail to recognize the fact that while cases present a wide difference in the degree of severity, and considerable diversity in the order of symptoms at the beginning, there is in all, both a universal disturbance of the general processes and functions of the body, and a recognizable sameness in the character and tendencies of such disturbance.

Diagnosis.—There can be but little difficulty in arriving at a correct diagnosis in all typical or unmixed cases of typhoid fever. The long and gradually increasing feelings of indisposition before the patient is compelled to take his bed, and the gradual increase of temperature and other febrile symptoms through the first week of confinement, are so different from the abrupt beginning, and rapid rise of temperature, in the general fevers I have already described, that it would hardly be possible to mistake one for the other. The same circumstances place it in still stronger contrast with the sudden access, high excitement, and rapid increase of temperature that characterize the first stage of fevers of the eruptive order; and in fact of all other acute general diseases except typhus. In the middle and latter stages of the disease, the addition of the fully developed abdominal tympanites, gurgling on pressure, thin passages, and generally blunted sensibilities, render the contrast between it, and the other general fevers more striking even than in the first stage. The untypical cases are far more likely to be confounded with sub-acute bronchitis or pneumonitis; or similar grades of inflammation affecting the mucous membrane of the stomach and intestines, on the one hand; and with remittent fever on the other. But the more important symptoms on which we must rely for correct diagnosis in these cases, were sufficiently indicated, when I was giving the detail of symptoms, and need not be repeated here. There have been some cases of sub-acute meningitis in children, of cerebritis in adults,

and of acute granular or miliary tuberculosis, that were mistaken for typhoid fever. It was only yesterday that I saw a case of the latter variety, in the person of a young girl of 13 years, who was represented to have just passed through a period of three weeks confinement with what was supposed to be typhoid fever, but which was only the acute stage of tuberculosis, as the whole upper part of the left lung is now giving all the physical signs of purulent softening or degeneration. Such cases can always be distinguished from the general fever by proper attention to the physical signs of incipient tuberculosis, and the absence of the characteristic abdominal symptoms of the typhoid disease. The cases of sub-acute meningitis in children, always present conditions and changes in the pupils of the eyes, and nervous startings, very different from anything accompanying the early stage of typhoid fever; and though the bowels are often loose in such cases, the character of the discharges are very changeable in color and quantity, and the abdomen lank, as if empty; a condition I have never seen in the general typhoid disease. Some of the cases of cerebritis certainly present a train of symptoms closely resembling the fever under consideration. A case of this kind occurred in the practice of the late professor James McNaughton of Albany, in the person of a young man who died from what had been regarded as a protracted typhoid fever, but which the post mortem examination showed to have been a case of cerebritis, terminating in suppuration, and a well formed abscess in the central part of one of the cerebral hemispheres. The case was reported with great candor and minuteness, more than twenty years since, by the distinguished professor, I have just named. In all the cases of cerebritis that have come under my observation, the pain in the head has been more circumscribed, penetrating, and fixed to one place, and the patient has exhibited much greater aversion to free movements of the head, than in the general fever. Again, in the inflammation of the interior portions of the brain, the abdomen is not only empty and free from tympanites, but generally the bowels are very costive, thus presenting conditions just the reverse of those found in the general typhoid disease.

Prognosis.—As I have already remarked, typhoid fever is limited in its duration, and its general tendency is to the recovery of the patient, especially if placed under favorable hygienic regulations; and yet the exceptions to this favorable tendency are sufficiently numerous to cause a high ratio of mortality. Its severity, and the consequent mortality, differs much in different seasons of its prevalence and at different periods of life.

A large part of the statistics concerning the ratio of mortality have been collected from hospital records, and undoubtedly give a much higher ratio of deaths than takes place in private practice, under ordinary circumstances. For instance, of over 18,000 cases, collected from the more important public hospitals of London, Glasgow, Paris and Strasbourg, by Dr. Murchison, over 18 per cent. or 1 in 5. 4 died. Of 1,420 cases mentioned by Dr. Liebermeister, as treated in the hospital in Basle, an average of 15 per cent. or 1 in 6.6, proved fatal. Dr. James Jackson, of Boston, in an interesting Report on Typhoid Fever, gives 303 cases treated in the Massachusetts General Hospital between the years 1828 and 1835, of whom nearly 13 per cent. or 1 in 7 died. Of 73 cases given by Dr. Austin Flint, 24 per cent., or 1 in 4 terminated in death. Dr. George B. Wood states, that of the whole number treated by him in the Pennsylvania Hospital of Philadelphia from 1850 to 1854, less than 6 per cent., or 1 in 17 died. In the general hospitals of New York, such reports and statistics as have come under my observation, lead to the inference that the average mortality resulting from typhoid fever cases is from

1 in 5 to 1 in 7, or from 15 to 20 per cent. During the thirty years from 1850 to 1880, there have been treated in the wards of the Mercy Hospital, under my care, 520 cases of well marked typhoid fever, attended by a mortality of 1 in 16, or 6.2 per cent. During the first ten years mentioned it was the only general hospital in this city, and as it then occupied, the greater part of the time, a building on Wabash Avenue, neither constructed for, nor well adapted to, hospital purposes, its capacity was overcrowded by fever cases from the poorest classes of society. Still the highest ratio of mortality reached in any one year was 1 in 9, or 11 per cent. On the other hand, since the completion of the present ample hospital building in 1869, several years have passed without a single death from this disease in the wards under my care. There are two reasons why the Hospital Statistics show a high ratio of mortality from this disease.

First, in this country especially, most of the patients admitted into the general hospitals are from the poorer classes of society, and have been living in the midst of bad sanitary conditions.

Second, they are seldom brought to the hospital until they have reached the middle period in the progress of the disease, and sometimes so late as to admit of no treatment, being really in a moribund condition. I am aware that Dr. Budd has estimated that the average number of cases of typhoid fever occurring annually in Great Britain is 140,000, giving an annual mortality of 20,000, or 1 in 7.

But from my own experience, and from what I have seen in the practice of others, I am satisfied that the ratio of mortality from typhoid fever under judicious management in private practice does not exceed one in from twenty to twenty-five, or from four to five per cent. The results are not only influenced by the different degrees of severity in different years, but also by the age of the patient. Far the greater number of cases occur between the ages of fifteen and thirty years, and the younger the patients the less is the ratio of mortality. But few cases occur after forty years of age, and a very high ratio of mortality results. Sex appears to exert but little influence over either the number attacked or the ratio of deaths. Those accustomed to the habitual or excessive use of alcoholic drinks yield a very high ratio of mortality.*

If the temperature of the patient is maintained at or above 40.5° C. (105° F.) during the last half of the second week of confinement, it indicates a great degree of danger. If a similar high temperature is continued both morning and evening during the third week of confinement, it is of still more unfavorable augury. But a high temperature found only at evening, while it recedes to 37.2° or 38.3° C. (99° or 101° F.) in the morning, either in the last part of the second, or during the third week, indicates a favorable result. My own clinical experience has led me to attach much less importance to the mere degree of temperature in typhoid fever, than is indicated in the works of most recent writers. I am certain that the condition of the kidneys, abdominal viscera, and lungs, afford a much more reliable guide for our prognosis than the temperature. If the kidneys fail to eliminate a full amount of urea and urates, either with or without the appearance of much albumen in the urine, even though the temperature of the body may be low, there is great danger attending the further progress of the case. The same is true if at any time after the middle of the second week the abdomen becomes largely distended with tympanites; the intestinal discharges frequent and somewhat mixed with

* Liebermeister states that of nineteen habitual drunkards having typhoid fever in the hospital at Basle, seven, or more than one-third, died.

blood, or unusually offensive; the spleen enlarged; with a soft, frequent and wavy pulse.

If, instead of a simple admixture of blood with the intestinal discharges a genuine intestinal hemorrhage occurs, it indicates great danger of an early fatal result. And *perforation* of the intestine, which sometimes occurs in the advanced stages of the disease, or even during convalescence, is pretty uniformly followed speedily by general peritonitis, vomiting, collapse and death. The number of cases in which the hypostatic engorgement of the lower and posterior part of the lungs, coupled with extensive congestion of the capillary bronchial tubes, so far interferes with the oxygenation and decarbonization of the blood, that the latter fails to sustain the functions of the nervous centres; the patient becomes very drowsy; pulse and heart's action weak; cutaneous capillary circulation feeble; and the sphincters of rectum and bladder relaxed, allowing more or less involuntary discharges, and finally death, is greater than you would infer from most of the works on practice within your reach. The fatal result in many of these cases is attributed to cardiac weakness, and alcoholic remedies are resorted to with the idea of strengthening the heart; while in truth they only increase the deficiency of blood oxygenation, still further anæsthetize the nervous centers, and hasten the fatal result.

LECTURE XII.

Typhoid Fever Continued---Its special Pathology, Pathological Anatomy, and Treatment.

GENTLEMEN: After what I have stated to you in the lecture on the general pathology of all idiopathic fevers, it is not necessary that I discuss at any considerable length the special pathology of any one member of the class. I then endeavored to trace the starting point of all fevers to an active disturbance of those general properties of living organized matter, that control atomic or molecular changes, and impart the capacity to receive organic impressions; in other words, to those general elementary properties that I have designated as susceptibility and vital affinity. The essential pathology of typhoid fever consists in such an impairment of these properties as to lessen the impressions of all the natural excitors of organic life, such as oxygen, light, heat, food, and mental activity, and to impair the regularity and activity of those atomic changes concerned in the processes of nutrition, disintegration, secretion, and elimination. In consequence of such impairment of the general properties, there necessarily follows corresponding impairment of nerve sensibility, of the generation of nerve force, and of the performance of all the primary functions of the body. The slow but steady increase of heat through the forming stage and first week of confinement, is evidently owing much more to a diminution of those processes by which free heat is rendered latent, than to any increase in the rapidity of tissue changes causing increased heat production. The impairment of the vital affinity on which the secreting structures depend for their ability to elect from the blood the elements necessary to form their respective secretions, rationally accounts for the general diminution of se-

cretions, and the constant tendency to the accumulation of effete matter in the blood, and the steadily increasing deterioration in the quality of that fluid. The same change in the force of affinity also lessens the tonicity of the tissues, favors passive congestions, hypostatic infiltrations, asthenic inflammation, with softening or ulceration, and fatty degeneration. You thus perceive that typhoid fever, instead of being a disease of excitement, of increased molecular activity from exaltation of the general properties, is one of true debility, both in regard to the strength or integrity of structures, and the activity of the various functions and processes. This view of the nature of the morbid processes constituting the essential pathology of this variety of fever, is in harmony with the nature of the causes known to favor its development, and also with the morbid anatomy or pathological changes in the solids and fluids presented in *post mortem* examinations. It matters not whether the disease is produced by the direct influence of the impure air of over-crowded dwellings, damp and unventilated places, impure water from soils impregnated with decomposable organic matter; excessive physical labor, and protracted mental depression and anxiety; or from some specific poison which may have gained access to the blood, it is evident that all these agencies have the tendency to depress or impair the properties and functions of the living body.

Pathological Anatomy.—The changes in the fluids and solids of the human body during the progress of a typical case of typhoid fever of ordinary severity, afford a very interesting field for study. The secretions and eliminations constituting one class of the fluids, are very generally diminished in quantity, as indicated by the unnatural dryness of the cutaneous and pulmonary surfaces, and the actually smaller quantity of saliva, gastric juice, and urine, secreted each day during the active progress of disease. The pulmonary and cutaneous exhalations vary much, both in quantity and quality, in different cases and in different stages of the same case. But the nature and extent of these changes, and their relations to the progress of the general disease, have not been accurately ascertained. The systematic and thorough investigation of these, with the aid of both analytical chemistry and the microscope, is worthy of your future attention. The renal secretion has already been investigated with much care and success. It has been ascertained that the quantity of urine voided in the twenty-four hours begins to diminish during the forming stage, and continues to decrease during the first week of confinement. In cases tending to recovery it increases during the second week, and returns nearly or quite to the natural quantity during the third.

In cases of more than average severity, and in those tending toward a fatal termination the quantity of urine voided is apt to vary much from day to day during the second and third weeks after the patient is confined to his bed. Sometimes the urinary secretion is so nearly suppressed as to cause a speedily fatal result. A man was brought into the Mercy Hospital only a few days since, in the third week of what appeared to be a case of ordinary typhoid fever. The mind of the patient was dull and incapable of giving any reliable history of his case. At the end of twenty-four hours it was ascertained that he had two or three intestinal evacuations, but had passed little or no urine, and during the following night he had general convulsions and died. Alterations in the constituents of the urine are also of much importance. The specific gravity is generally increased in proportion to the diminution in the quantity of urine. The quantity of chloride of sodium is decidedly diminished. The sulphuric and phosphoric acids are found to remain nearly the same as in health. But the urea, uric acid and colored pigment are decidedly increased, not

only relatively to the quantity of urine, but absolutely above the usual quantity of these ingredients in health. The increase of urea and uric acid is most marked during the first two weeks from the initial symptoms. During the third week it is more variable, being sometimes above and at others below the natural standard. The latter is almost always the case during the period of convalescence. Neither the absolute quantity of urine voided, nor the relative proportion of its several constituents, have been found to bear any fixed or uniform relation to the degree of pyrexia or fever heat. So true is this, that in many of the most dangerous cases when, during the third or fourth weeks the temperature has risen to 40° or 41° C. (104° or 106° F.), the amount of urea excreted in a given time has been found so much below the natural standard as to cause just fears of uremic poisoning from its retention in the blood. During the first two weeks of typhoid fever the urine gives a stronger acid reaction than in health. This is caused by the greater concentration from diminution of the watery element, and not from an increase in the quantity of acids, for the most reliable analyses show the total amount of acids eliminated in the twenty-four hours, to be less than in health. In the third and fourth weeks of the more dangerous cases, the urine gives a decided alkaline reaction from the presence of a fixed alkali.

Besides the foregoing changes in the natural constituents of the urine, albumen has been found in some part of the progress of about one-third of the cases examined. In a large majority of these cases, the presence of albumen was only temporary, while in a smaller number it continued and was associated with renal epithelium, tubular casts and blood corpuscles. And in a very small number these elements remained after complete convalescence from the fever, and constituted the beginning of Bright's disease. The secretion of bile is generally diminished, as shown by examination of the intestinal discharges, though seldom suppressed. Dr. Hoffman, who took special pains to investigate the quantity and quality of this secretion, found it to be thin and much less colored in one-fourth of the cases examined.* I am not aware of any special investigations concerning the composition and properties of the salivary, gastric, and pancreatic secretions in continued fever. The general indications are that they are decidedly diminished in quantity during all the active or advancing stage of the disease. The only source from which an increase of secretion or exudation takes place in nearly all the cases of typhoid fever, is the mucous membrane of the ilium and colon. The intestinal evacuations are very notably increased, as I have stated in detailing the symptoms, during all the middle and later stages of the disease, and in some cases from the beginning. Such increase, however, is not from an increase of the natural secretions from the various glandular structures contained in the mucous membrane, but an exudation from the locally diseased glands, and consists mostly of the water or serum of the blood holding in suspension some mucous, epithelium cells, the debris of food and fœcal matter, sometimes blood corpuscles, and various saline ingredients. The exudation comes chiefly from the aggregated glands of Payer and the solitary glands of Brunner in various stages of asthenic inflammation.

And though most of the pathologists of the present day, represent the so-called typhoid fever germs as existing in the intestinal evacuations of patients laboring under that disease, yet no one has thus far been able to identify any such germs as peculiar to the discharges in this variety

* See Ziemssen's Cyclopœdia, Vol. I, p. 106.

of fever. The blood itself undergoes important changes during the progress of this disease. During the period intervening between 1850 and 1860, I made a careful and somewhat extended investigation of the blood at different stages, of both typhoid and periodical fevers.

I took from the arms of several typical cases of typhoid fever in the wards of the Mercy Hospital under my care, sufficient blood for full chemical and microscopical analysis, in the first, second, and third weeks in the progress of the disease. I also examined specimens of blood taken from the cavities of the heart in some cases resulting fatally.

It is not proper to occupy your time here with the detail of these investigations. I will state the results as follows: To ordinary inspection the blood taken during the first week was a shade darker color, than healthy venous blood; that during the second, a little darker than the first; that taken during the third week in bad cases, and that found in the right cavities of the heart after death, was much darker in hue than either of the previous specimens. That taken during the third week from cases tending to recovery, had not changed perceptibly in color, from that taken earlier in the progress of the disease. All the specimens coagulated more slowly than healthy blood; the clot formed was larger, softer and more easily torn than natural. This diminished coagulability and tenacity of the fibrin became more marked, as the disease advanced; and in some of the fatal cases the blood remained fluid after death, very dark color, with a film of oil over the surface. The clot was not only slow in forming, but contracted very little after it had formed, and was easily lacerated or broken to pieces. The small amount of serum that separated from the clot looked more turbid than the serum of healthy blood. Examinations with the microscope showed no marked changes except that the red corpuscles appeared less disposed to adhere together in rows, and some of them were corrugated and irregular in outline as if commencing to disintegrate; there was very little, if any, increase in the number of white corpuscles; here and there a fat granule with many specks or shreds of what appeared to be the debris of disintegrated corpuscles were seen, more especially in the specimens of blood from the advanced stage of severe cases; and there was more or less hæmatin or red coloring matter in the serum. Careful quantitive analysis showed a progressive, though moderate, diminution in the relative proportion of albumen, red corpuscles, and chlorides, as the disease advanced. On the other hand, the white corpuscles, fatty and extractive matters, were moderately increased, while the fibrin varied from 2.2 to 2.8 parts in 1000, which is nearly the same as in healthy blood. From these investigations it appears that the nutritive and formative constituents of the blood undergo a progressive moderate diminution in their relative proportion as the fever advances through its several stages, and the products of tissue disintegration increase. If there are any exceptions to this rule, it is in the apparent increase in the number of white corpuscles and the continuance of the natural proportion of fibrin. I think further investigations will show that the increase of the former is derived altogether from the lymph in the lymphatic vessels returning matter from the organized tissues, and the proportion of fibrin will be found to vary in strict accordance with the variations in the quantity of urea and uric acid excreted from the kidneys. So long as the quantity of urea continues large, the fibrin in the blood will be found at or slightly below the natural standard, and *vice versa*. As you will have seen by the detail I have given, the *quality* of the more important organic constituents of the blood, is impaired to a much greater degree in typhoid fever, than the *quantity* or relative proportion of each. Ever since the analyses of M. M. Andral and Gavarett,

authors have represented the fibrin of the blood as particularly deficient in both typhoid and typhus.*

These distinguished investigators in separating the fibrin from the other constituents of the blood, practiced the very common method of stirring the freshly drawn blood with a bundle of rods for the purpose of entangling the fibrin on them as it solidifies. This mode is sufficient when the fibrin coagulates with its natural degree of readiness and tenacity. But I found in the advanced stage of bad cases of typhoid fever, these properties of the fibrin so impaired that very little could be gathered upon the rods by diligent stirring for an hour. The same blood, however, when allowed to stand at rest three hours or more presented a large, soft clot, which, when enclosed in clean, firm linen cloth, and washed under a stream of water until all the corpuscles were removed, as practiced by Dr. Bence Jones, of London, gave a proportion of fibrin equal to 2.3 per 1000. These facts have led me to think, the very prevalent idea, that the quantity of fibrin in the blood of patients affected with the lower grades of continued fever is very deficient is not altogether correct. Turning from the fluids to the various organized structures of the body, we can find some appreciable changes resulting from protracted and fatal cases of typhoid fever, in nearly all of them. In the nervous, muscular, vascular, and secreting structures generally, a critical examination aided by the microscope, shows some degree of softening or impairment of the tonicity and tenacity of the textures accompanied by more or less fatty degeneration. These general degenerative changes and impairments of texture, are attributed by most writers and teachers to the influence of the protracted high temperature, and not to anything belonging to the essential pathology of this variety of fever. So far as a high temperature impairs the force of vital affinity and thereby retards the molecular changes in the several tissues, it aids in the work of cell and granule degeneration.

But you must keep in mind the fact that impairment of the property called vital affinity is an essential and primary part of the pathology of this fever, and its steady increase during the progress of protracted and fatal cases, is abundantly sufficient to cause the general impairments of textures without regard to the direct influence of heat, especially when aided by the imperfectly oxygenated and decarbonized condition of the blood existing in the middle and later stages of all those cases in which the capacity of the lungs is diminished both by congestion of the bronchial membrane and hypostatic engorgement of the more dependent portion of the lungs.

I have no doubt but the primary impairment of the vital affinity, the increased temperature, and the imperfect oxygenation of the blood all cooperate in producing the very general softening and molecular degeneration, that is found in nearly all the organized tissues of the body after death from typhoid fever. You will find these general changes, in making ordinary post mortem examinations, most noticeable in the dark color and passively engorged condition of the posterior portion of the lungs, the softened condition of the muscular structure of the heart; and the enlarged and softened state of the spleen and liver. But the special pathological changes of structure, universally regarded as characteristic of this fever, are found in the aggregated and solitary glands in the mucous membrane of the ilium;—the glands of the mesentery; and the spleen.

The aggregated glands of Payer, or elliptical plates, as they are often

* See Flint's Practice, 5th Ed., p. 951.

called, evidently become red and tumefied early in the progress of the disease. And after death, they are found in all stages of morbid change, from simple redness and swelling sufficient to make their outline easily recognized, to complete destruction by softening and ulceration until only an open ulcer, with abrupt margins, and the muscular fibres of the middle coat of the intestine at the bottom, occupies the place where the gland had been. The solitary glands of Brunner are generally much enlarged, but not often ulcerated. The glands in the mesentery opposite the changes in the mucous membrane, are also found increased in vascularity, enlarged, softened, and sometimes reduced to a pulpy or creamy consistence. All these changes are found in the greatest degree of progress in the lower part of the ilium and at its junction with the colon, diminishing as we ascend the intestine until at the distance of three metres (ten feet) they are absent altogether. If you examine these fresh specimens of the lower section of the ilium, which have been laid open to expose fully the mucous membrane, from the ilio-colic junction upward for a distance of one metre, or about three feet, with portions of the mesentery attached, containing several mesenteric glands in various stages of enlargement, from the size of a pea to that of a hickory nut, you will have a better knowledge of these morbid changes than I could impart by any mere verbal description. Beginning at the upper part you see several of the elliptical plates of Payer merely reddened and elevated by swelling, enough to make their outline easily recognized. A little lower, there are others more elevated, with small excavations on the surface, indicating the commencement of ulceration. Around and between these you see quite a number of single, round, elevated bodies near the size of small peas, which are the inflamed and enlarged glands of Brunner. Still lower, or nearer to the junction with the colon, you see not the glandular structures elevated and undergoing the process of softening, but in their place open oval-shaped ulcers, with abrupt and somewhat irregular margins, and between them the mucous membrane, generally redder than natural. Some of the adjacent enlarged mesenteric glands I have laid open by an incision, and you see their interior presenting evidences of increased vascularity and in various stages of softening with some caseous degeneration.

There is another shorter section of the lower part of the ilium, not fresh, but selected from the wet preparations in the museum, in which you see a large ulcer occupying the place of one of the elliptical plates, with a complete perforation of the muscular and peritoneal coats. It was taken from a patient who was brought into the hospital in a state of collapse preceded by all the characteristic symptoms of sudden perforation, general peritonitis, and death. The constancy with which these intestinal glands are found diseased in making *post mortem* examinations of typhoid fever patients, has led some pathologists to regard them as the essential and primary seat of the disease.

The well ascertained facts, however, that the extent of the disease in these glandular structures bears no uniform relation to the severity and danger of the general fever, and that the earlier the patient dies from some unusual malignity of the fever, the less are the appearances of disease in the intestines and mesentery, show the latter to be consequences or results of the general morbid actions set up throughout the system. And as a rule, the more protracted the course of the fever, the more extensive will be the ulceration of the aggregated glands in the ilium, the enlargement and softening of the mesenteric glands and spleen, and the molecular degenerations of the muscular and nervous structures generally. You will not fail to perceive from the detailed description I have given,

that the entire series of changes taking place during the progress of the general fever are in the direction of impairment of tonicity, passive congestions, molecular degenerations, softening of texture, and ulcerations in the glands of the intestinal mucous membrane. Wherever inflammatory action is set up, whether in the alimentary canal, the lungs, or the brain, it assumes a purely asthenic character, leading directly to tumefaction, softening, ulceration or gangrene. Nowhere do we find plastic exudations or indurations of structure. In a few instances, small gray deposits, looking much like miliary tubercles, have been observed in the tumefied glands of the ilium. By some they have been called typhus deposits, but their presence does not appear to alter in any way the usual tendency to softening and ulceration of these glands, and it is doubtful whether they possess any pathological significance.

Treatment.—From the facts and considerations I have now presented to you concerning the causes, clinical history, and special pathology of this important general disease, we may see clearly several important indications to be fulfilled, or objects to be accomplished, in its treatment.

First, it is desirable to suspend as far as practicable the further action upon the patient, of all the causes that may have contributed to the development of the disease.

Second, to restore the natural condition of the general properties of the tissues, and thereby retard or arrest those perverted molecular movements which constitute the disturbances of nutrition, secretion, excretion, etc.

Third, to promote the action of certain excretory organs and thereby prevent deterioration of the blood by the accumulation of the products of tissue changes or waste matter.

Fourth, to counteract the development of important local diseases, either in the head, chest or abdomen.

Fifth, to sustain the patient with nourishment suitably adjusted, both in quality and quantity, to the different stages of the disease.

These several objects, gentlemen, are not to receive your attention in consecutive order of time, as I have named them, but as distinct objects to be accomplished in the management of all general acute diseases. They should be clearly before your minds at every visit to the bedside of your patient, from the beginning to the end of your attendance.

To fulfill properly the first indication named requires both a proper regulation of all the hygienic surroundings of the patient, and, so far as the present state of medical knowledge will permit, the administration of such remedies as will either neutralize or expel the specific fever poison from the system, if such poison exists. To secure for your patient an abundance of fresh, pure air, at a comfortable temperature; to secure a high degree of cleanliness by suitable changes of shirts and bed-clothes, and frequent ablutions; and to have all evacuations from the kidneys and bowels promptly removed from the room; are matters of the highest importance, and should not be overlooked for a single day in any stage of the disease. Unfortunately you will meet with a large proportion of your cases of typhoid fever among the laboring classes, occupying small, badly ventilated bed-rooms; and in large towns and cities, especially, in tenement houses or small buildings on narrow streets and alleys, and sometimes in damp basements. In many such cases a proper supply of fresh and pure air is not to be obtained, and you will be obliged to have them removed from their homes or treat them under the disadvantage of an insufficient degree of ventilation. Many of this same class of patients will have an inadequate supply of shirts and sheets to permit the changes necessary for insuring a healthful degree of cleanliness; and not a few of them will

persist in keeping on two or three coarse woolen shirts all saturated with the cutaneous eliminations for a week or more, even if they have a plentiful supply. It is your duty, however, in all cases, to exercise your influence in procuring for those under your care the best degree of ventilation and cleanliness that the circumstances will permit. By so doing you will remove as far as practicable the further action of those influences that are generally recognized as predisposing causes. If we admit the existence of a specific fever poison in the blood, as the essential or direct exciting cause, to suspend its further action requires the use of such remedies as will either neutralize the poison or cause its elimination. As we have no reliable knowledge, however, concerning the nature and properties of this supposed poison, we have no guide for the selection of remedies to act upon it. But, in consequence of the known deficiency of the chlorine salts in the blood and its defective arterialization, as shown by the early and marked deficiency of these constituents in the urine and the darker color of the blood, we may give the chlorate of potassium in solution, acidulated with the hydrochloric acid, for the purpose of supplying these deficiencies, and the free chlorine which the solution contains will constitute as efficient an antiseptic for destroying organic germs in the blood as any we could administer with propriety. Ever since the ingenious experiments of M. Bernard, by which it was demonstrated that the capacity of the blood for taking up oxygen was increased by the addition of the chlorates and other salines, I have used the chlorate of potassium in dilute acidulated solution, in the early stage of typhoid fever, and with marked benefit. Whether the benefit obtained, is owing to the action of the free chlorine on the supposed fever poison, or to the increased amount of oxygen taken up from the air-cells of the lungs by the addition of the chlorate of potassium to the serum of the blood, or to both, I do not know.*

That increasing the chlorate of potassium in the blood increases the oxygenation of that fluid, I have demonstrated many times, clinically, by giving it to children affected with cyanosis from congenital defects in the heart.

That an abundant supply of pure air, not only increases the oxygenation of the blood and resists the impairment of the quality of its constituents, but also greatly improves nervous sensibility and promotes the natural molecular changes in all the structures of the body, and thereby greatly increases the tendency to recovery from attacks of typhoid and other low forms of fever, has been abundantly proved by clinical observation. I think it was the uniform experience of members of the medical staff of the army during the late war for maintaining the Union, that whenever they were obliged to treat their fever patients in tents, or simply under canvas, a very much larger ratio of recoveries took place than when they were treated in the wards of their best regulated hospital buildings.

* From the recent investigations of M. Pasteur, concerning the effects of simple dilution and exposure to the oxygen of the air, of infectious organic poisons, in lessening their virulence and finally rendering them wholly inactive, we derive additional proof that oxygen, is not only an excitor of organic life, but also one of the most efficient germicides or antiseptics.

LECTURE XIII.

Typhoid Fever continued—Treatment.

GENTLEMEN: At the close of the lecture yesterday, I was directing your attention to the several indications to be fulfilled, or objects to be accomplished, in the treatment of typhoid fever. I had named five such distinct and important objects, and had explained as fully as necessary the best means for accomplishing the first of the series then mentioned. The second, was to restore the general properties of the tissues to their natural condition, and thereby retard or arrest those perverted molecular movements which constitute the disturbances of nutrition, secretion, excretion and calorification, on which the prominent symptoms of the disease depend. As I endeavored more fully to explain, when speaking of the causes and pathology of the fever under consideration, the properties of the blood and tissues are impaired from the beginning to the end of the disease.

This impairment is the result of such cause or causes as exert a depressing influence on the properties and functions, and hence the first step in the fulfillment of this second indication is, to remove the further action of all such causes by the same means described in the closing part of the previous lecture.

And, if as then indicated, you can from the beginning of the disease have the patients supplied with an abundance of fresh, pure air; sufficiently sponged over with water daily, to preserve cleanliness and promote healthy exhalations from the cutaneous surface; and supplied with proper nourishment, in proper quantities, twenty-nine out of every thirty will recover without medication of any kind. But as stated yesterday, a large proportion of our typhoid fever patients are found in such condition and with such surroundings, that the healthful influences just mentioned cannot be secured to the extent necessary for safe reliance, and other means must be found for directly or indirectly increasing the susceptibility and vital affinity throughout the tissues of the body. Of those agents which act directly as excitors of vital affinity, and thereby promote the natural molecular changes, none are probably more efficient than oxygen, the mineral acids, the chlorine salts—more especially the chlorate of potassium—chloride of sodium, bichloride of mercury, iodine, and cold water. The practical application of any one of these general excitors must be determined by collateral circumstances. For instance, the direct administration of oxygen is inconvenient, on account of its bulk in the gaseous form, and the impracticability of trusting its administration to nurses and ordinary attendants on the sick. But so far as you can increase the quantity and purity of the air of the sick room, and by administering judiciously the chlorate of potassium or chloride of sodium, increase the capacity of the blood to take up the oxygen from the air-cells of the lungs, in the same proportion you will increase the quantity of oxygen circulating with the arterial blood and exerting its natural vivifying influence on the properties and functions of the system.

The amount of the chlorate of potassium given, must be so limited as not to endanger undue action on the mucous membrane of the intestines.

And the same remark applies with still more force to the use of the chloride of sodium and the bichloride of mercury, but less to iodine, if given in the form of aqueous solution or tincture. If you have properly studied the nature and action of remedies, you will notice that the agents I have just mentioned, are not only general excitors of tissue properties, and promoters of blood arterialization, but also actively antiseptic, and therefore well calculated to destroy any organic fever poison that might exist in the blood. If any among you have become imbued with the popular idea that all mercurials merely act on the liver and some other glandular organs, and depress the powers of life by impairing the plasticity of the blood, you will be surprised to hear me mention the bichloride of mercury as one of the leading agents for promoting the general properties of the tissues and preserving the blood from deterioration. It is now nearly forty years since, while listening to a clinical lecture by the late Dr. Valentine Mott, I heard that most eminent of surgeons recommend for a delicate, pale looking girl, with irritable scrofulous ophthalmia, a combination of the bichloride of mercury, with tincture of cinchona bark, to be taken internally three times a day. And truth compels me to say, gentlemen, that through all the changes of medical fashions and prejudices, from that time to the present, I have derived more benefit from the use of small doses of this preparation of mercury, given in conjunction with some of the preparations of cinchona, in the treatment of depressed, depraved and cachectic conditions of the system, than from all the preparations of iron, cod-liver oil, and so-called alcoholic stimulants, to be found in the list of remedial agents. And strangely enough, at this late day, direct experimental investigations have proved that small doses of the bichloride taken internally actually increase the number of red corpuscles in the blood and promote its plasticity. Nevertheless, its practical value in the treatment of typhoid fever is limited mostly to the early stage, on account of its tendency to increase the intestinal evacuations. The same is true in regard to the use of the mild chloride or calomel. Iodine has long been known and used as a general alterative and tonic of great value in the treatment of chronic affections of a general or constitutional nature, and as an efficient antiseptic; but its use has not until very recently been extended to the treatment of the general acute diseases or fevers. At the present time, however, both iodine and mercury are being urged as specific remedies for the cure of typhoid fever. The revival of this idea in relation to the specific curative effects of mercury, especially in the form of ten-grain doses of calomel, repeated once or twice in the twenty-four hours during the early stage of the disease, we owe, as we do the revival of many other extravagances, to the profession in Germany. I say *revival* of the idea, because it is no more novel or original at this time than is the use of large antipyretic doses of quinine, or the refrigeration with cold water. The last named method was thoroughly tested and strongly recommended by Dr. Currie, of London, a century since; and as I have stated in a previous lecture, quinine has been given in quantities sufficient for the most efficient antipyretic effect during the first and second weeks of typhoid fever, by the physicians of the south and west during the earlier periods of the prevalence of that variety of fever in those sections of our country. And during the same period, namely, from 1835 to 1850, mercurials in the form of calomel and blue mass, were tried with equal thoroughness, in all doses from one to twenty grains, and repeated from one to six times in the twenty-four hours. I have myself seen, during that early part of my professional life, more than a score of cases of typhoid fever pretty fully salivated from the calomel administered during the first week or ten

days of their progress. Most certainly, if there had been any specific curative power possessed by either quinine or mercurials in the treatment of any variety of continued fevers, it should have been so fully demonstrated by the practices of half a century ago in this country, that their use would have become as firmly established and universal as is the use of quinine in the treatment of intermittents. The demonstrations, however, were all in the opposite direction so strongly, that even the most conservative among us at that time, were rapidly forced from large doses to small ones, and from small ones to none at all. And to complete the history, I only need say we passed from no active medicines, or simple *expectancy*, to positive efforts at stimulation, and from food and so-called stimulants, we are now gracefully invited back to the fullest doses of active medication. It is only necessary now, gentlemen, that some one occupying a prominent position in Germany, or some other European State, should publish a score or two of cases in which the treatment was commenced with an emetic or emeto-cathartic or a moderate venesection, accompanied by such a statement of the ratio of mortality as to show better results than had been obtained by some other methods of treatment, and the cycle of medical progress will be complete, and therapeutics in relation to continued fevers will stand very nearly in the same position as half a century ago. The principal difference will consist in the fact, that somewhere in our professional progress around the circle, we have unconsciously ceased to group our remedies under the names of evacuants, alteratives, and antiperiodics, and now call them either *specific* remedies, antipyretics, or paraciticides.

The third object to be kept constantly in view while directing the treatment of typhoid fever, is, to so far promote the action of the more important excretory and eliminating organs as to prevent the deterioration of the blood by the accumulation of the products of tissue changes, including waste matter and heat. The organs or structures through which the greater part of the waste matter derived from ordinary tissue changes, is eliminated from the blood and cast out of the system, are the kidneys, lungs and skin. These organs not only eliminate the greater part of the natural waste material, but they also eliminate most of the foreign and disturbing elements that find their way into the blood from without, and also do much to regulate the temperature of the body, by the quantity and form of the matter that passes from the lungs and skin. As the functions of these several organs are especially liable to be impaired during the first two weeks, as I pointed out to you in describing the symptoms and progress of the fever, you cannot be too vigilant in observing their condition and in adopting such measures as will increase their activity when necessary.

Aside from keeping the air of the sick room pure and at a proper temperature, there is probably no measure better calculated to promote natural exhalations from both skin and lungs, than frequent spongings of the surface with water of such temperature as is most agreeable to the patient. It lessens the frequency and increases the fullness of respiratory movements, while it reduces the temperature and promotes the exhalations from the cutaneous surface. The latter, together with the action of the kidneys, may be also materially increased by the administration of proper medicines.

In selecting medicines to promote the action of the skin and kidneys, care must be taken to choose those diuretics and diaphoretics that are not liable to disturb the bowels.

Perhaps none are better adapted to the early part of the progress of

typhoid fever than the nitrous ether, the liquor ammoniæ acetatis, and the digitalis, either separately or in combination.

The fourth important object which should constantly engage the attention of the practitioner while managing this variety of fever, is, to counteract the development or retard the progress of serious local diseases, either in the head, chest or abdomen.

Both clinical experience and *post mortem* examinations show that much the larger number of deaths resulting from this fever are determined by the nature and extent of the local lesions which develop in some of the most important organs during the progress of the general disease. Consequently much of your success at the bedside will depend upon the readiness with which you detect the existence of complications and the skill you exhibit in palliating or removing them. Nor is this all; for when cases come under your care early, an accurate knowledge of the natural tendencies to develop certain local affections, and a careful examination of the relative susceptibility of the different groups of organs in each patient, in connection with the season of the year and special sanitary surroundings, will enable you sometimes to so order your remedial measures as to prevent serious complications that would otherwise occur. A careful analysis of past clinical experiences, aided by the results of *post mortem* examinations, has satisfied me that we have one of three leading sources of danger to encounter in all severe cases of typhoid fever, and in some all the three are presented in the same patient.

One of these consists in impairment of the functions of the brain and important nervous centres, more especially those centres that govern the action of the vaso-motor, cardiac, and respiratory nerves. That the functions of the whole nervous apparatus are disturbed, and in many instances profoundly impaired, is readily seen by the symptoms, and is acknowledged by all writers. And yet it has seemed to me that very few have fully appreciated the importance of that impairment of the vaso-motor influence by which the tonicity and action of all the smaller vessels is impaired; passive and hypostatic congestions and exudations encouraged, especially in the more vascular and distensible structures like the lungs, spleen, and mucous membranes; or of the impairment of the closely associated centres governing the action of the heart, lungs, and sphincters of the rectum and bladder, by which the muscular force of the heart grows weaker, the respiratory movements less steady and efficient, the sphincters weakened, and ultimately paralyzed or relaxed, as the disease progresses through its successive stages. It is this progressive impairment of the motion of the blood in the smaller vessels and capillaries, co-operating with the general impairment of vital affinity, that not only favors passive engorgements and exudations, but also that softening of texture and fatty molecular degeneration described when speaking of the morbid anatomy of the fever.

It is in these morbid and degenerative processes that much of the water drank by the patient is used up, instead of re-appearing in the cutaneous and renal secretions. And it is by these same processes and absorption of the water that the excess of heat is evolved and the high temperature maintained; the latter being an effect and not the cause of the morbid changes in the tissues.

If I am correct in the expression of these views, then certainly you cannot be too vigilant in selecting, or too careful in adjusting such remedies as will maintain the sensibility and functional activity of the several nervous centres to which I have just alluded. During the early stage of the disease you can accomplish this purpose best indirectly by the same agents that increase the oxygenation and decarbonization of the blood, increase

nerve sensibility, and remove the further action of the predisposing and exciting causes of fever, as I more fully stated when speaking of the means for accomplishing the first and second objects enumerated. But when the first stage has passed and the symptoms of special failure in these important nervous functions are becoming more prominent, you must find some remedies that will more directly and efficiently sustain them. For this purpose I have found nothing in the materia medica equal in efficiency to strychnia and the mineral acids. I commenced the use of strychnia in the treatment of the advanced stage of bad cases of typhoid fever as early as 1850. At first its use was limited to such cases as began to show loss of action in the muscular coat of the bladder or diminished control over the sphincters of the body; but further experience showed that by commencing its use earlier and continuing it in doses sufficient to act as a nerve and muscular tonic, the more extreme and dangerous failures of innervation, as indicated by loss of control over the action of the bladder and rectum, very rarely took place. I usually give it in solution with nitric acid, and when too much looseness of the bowels exists, I add tincture of opium in proper proportion to the mixture. Direct inflammation in the nervous centres or their membranous coverings I have seen in but few cases of typhoid fever. One such case occurred in the wards of the Mercy Hospital a few weeks since, and proved fatal. The best means for combatting it are, local bleeding by leeches, cold applications to the head continuously, and later, the application of blisters to the neck and mastoid spaces. The internal administration of iodide of potassium and digitalis may also be used more freely than in uncomplicated cases of the general fever.

In those cases where cerebral symptoms are developed from the retention of urea, relief can be obtained only by promoting the elimination of the retained poison from the blood by such means as will increase the action of the skin and kidneys.

The local affections of importance most liable to occur in the chest, are extensive hypostatic or passive engorgement of the lower and posterior portion of the lungs; capillary bronchitis, broncho-pneumonia, and softening or degenerative changes in the muscular structure of the heart. When either of the three first named pathological conditions are sufficiently extensive to greatly lessen the amount of air reaching the air-cells of the lungs, it adds very much to the danger of a fatal result.

The hypostatic engorgement of the lungs, and muscular weakness of the heart, are to be counteracted by the same means that increase general tonicity and innervation, as I have already indicated when speaking of the means for sustaining the general properties of the tissues, and for maintaining the sensibility of the nervous centres. It is in this variety of cases, and especially in those characterized by cardiac weakness, that most writers and teachers advise the free use of alcoholic remedies, in the form of wine, brandy, and whisky. But no fact in therapeutics has been better established by direct experimental investigations, than that alcohol when introduced into the blood, both diminishes the interchange of carbonic acid gas and oxygen in the capillaries and air-cells of the lungs, and the sensibility of the nervous structures generally. Inasmuch as the blood in the class of patients now under consideration is already darker in color and less coagulable than natural, and the capacity of the lungs for air diminished in proportion to the amount of hypostatic infiltration, while the general sensibility of the nervous systems, both cerebro-spinal and vaso-motor, is blunted in a marked degree, it is extremely difficult to see a rational basis for the administration of alcohol in any form.

The general idea appears to be, that it directly strengthens and sustains the muscular force of the heart. But do carefully observed clinical facts, or the results of clinical experience sustain this idea? I have embraced every fair opportunity for studying this question practically that has occurred to me during the last thirty-five years; and with due deference to the opinions of others, and a full sense of my own responsibility, I must answer it in the negative. Neither by cardiac auscultation, nor by the disciplined sense of touch, nor by the sphygmograph, have I been able to detect in a single case an actual increase of cardiac force. When a fair dose of wine or brandy is first given it often causes the heart to give from five to ten beats more per minute than before, and the sphygmographic line will both rise and fall more abruptly, but with less steadiness or uniformity. This apparent excitation, which generally continues not more than ten, or at the longest, fifteen minutes, is evidently caused by the direct irritative action of the alcohol on the gastric branches of the pneumogastric nerve, and is evidence of mere temporary disturbance or purturbation instead of increased strength. In from twenty to thirty minutes, or so soon as the alcohol has had time for absorption and circulation through the system, it begins to show its true anæsthetic effects on both the cerebro-spinal and vaso-motor nerves, by calming the patient's restlessness, lessening subsultus if it exists, slightly lessening the frequency of respiration and circulation, and increasing the disposition to sleep. But these apparently favorable effects are accompanied by impairment of the vaso-motor influence over the whole vascular system, as indicated by relaxation of the cutaneous capillaries, lessening of urinary secretion with more frequent appearance of albumen in it, softness or compressibility of the pulse, and diminished cardiac impulse. And if the doses are repeated at intervals of one or two hours, so as to keep the effects uniform; the patient continues the same general aspect of quietude, but the tone of the vascular system becomes steadily more impaired, as indicated by increasing weakness of pulse, undue sweating, scantiness of urine, increasing size of the spleen, more hypostatic engorgement of the lungs, with general sub-mucous rhonchus, and but feeble efforts to expand the chest, and more drowsiness or mental indifference; until, in from one to two weeks after the treatment is begun, in many cases the combined influence of the anæsthetic effect of the alcohol and the imperfect oxygenation of the blood from passive pulmonary obstruction, so far suspends the sensibility of the excito-motor nerve centres that the sphincters of the bladder and rectum relax, the discharges becomes involuntary, and the patient dies. The death in such cases is not from simple asthenia or exhaustion, as is generally supposed. For if we compare the amount of nourishment taken in the form of milk, beef tea, eggs, etc., with the amount of discharges from day to day, we will find that the patient has taken and retained a sufficient supply to prevent any dangerous degree of exhaustion. But the fatal result is traceable directly to progressive enfeeblement of respiration and capillary circulation from failure of the influence of the vaso-motor and excito-motor nervous systems, causing loss of tonicity in all the tissues and special passive engorgements in the more vascular and distensile structures like the lungs and spleen. This final failure of nervous force or innervation, and of capillary and molecular changes, is undoubtedly owing to the impairment of the quality of the blood and properties of the tissues which I have already explained as constituting the essential pathology of the disease. What I claim in regard to alcoholic remedies, is, that by the anæsthetic effect of the alcohol they contain, they directly increase the impairment of nerve-force, and by its well known effect in

lessening the interchange of waste carbonic acid gas for oxygen in the air-cells of the lungs, they increase the blood degeneration and still further lessen its power to excite or sustain either nerve-sensibility or molecular movements. I might illustrate these effects by the relation of a large number of clinical cases from my note-books, but I will trespass upon your time for a brief narration of only two, as specimens.

The first, occurred nearly thirty years since, in the person of a young man in a boarding house on Michigan Avenue, between Lake and South Water streets, a section of the city then occupied entirely by residences. I was first called in consultation with the attending physician, who related to me the history of the case, which corresponded in all respects with the history of a typical case of typhoid fever of average degree of severity, it being at the time of my visit at the commencement of the third week after the patient had taken to his bed. I found him lying on his back; face dingy, pale; lips a little retracted and edges slightly purplish, or of leaden hue; a little sordes on the exposed part of the teeth; expression of face dull and relaxed; tongue covered over the middle and back part with a thick, moist coat, but more red and dry at the tip and edges; the cutaneous surface was generally moist, cool and of leaden hue over the extremities, but above the natural temperature over the chest and abdomen (clinical thermometers were not then in use), the latter moderately tympanitic and gurgling on pressure; pulse 110 per minute, very soft and weak; respirations 22 per minute, the expansion of chest by inspiration very imperfect with short expiratory act and sudden fall of the abdominal muscles, and copious sub-mucous râles over the whole anterior and lateral parts of the chest, with decided dullness posteriorly. The urine was scanty, but was not tested for albumen; the intestinal evacuations occurred from three to six times in the twenty-four hours, were thin, greyish yellow, containing white flakes, and during the last twenty-four hours had been only partially controlled by the patient. The hearing was dull and the mind very torpid or inactive, but not delirious. The symptoms that had alarmed both the friends and the attending physician, were the rapidly increasing passive engorgement of the lungs, with the plain indications of imperfect oxygenation of the blood, feebleness of the pulse, and impairment of the action of the sphincters of the rectum and bladder. The patient had been fed principally with beef tea and other animal broths during the first week, with only a little wine, but during the last preceding five or six days, to these had been added a liberal supply of egg-nog and milk punch, containing whisky. And as the respiration and circulation became weaker or less efficient, the latter was increased until during twenty-four hours preceding my visit he had consumed nearly a tablespoonful of whisky every hour. As the whole aspect of the case strongly indicated deficient oxygenation and decarbonization of the blood, and the experiments of Dr. Prout had fully demonstrated the fact that the presence of alcohol in the blood directly diminished the absorption of the oxygen and the elimination of carbonic acid gas from the air-cells of the lungs, I suggested to the attending physician the propriety of omitting the further use of the whisky and all other alcoholic remedies, and trust the case to simple nourishment, small doses of quinine, and an emulsion of oil of turpentine and laudanum sufficient to keep the intestinal discharges within proper limits. He, at once, rather warmly protested that the "stimulants," as he called the wine and whiskey, had been the efficient means of keeping the patient alive for several days past, and that their withdrawal now would be followed by certain, and speedily fatal, prostration. And as I expressed an earnest desire to see the experiment tried, he unexpectedly

withdrew from further attendance, and left the case with all its responsibilities, in my hands. Nothing daunted by this, however, I ordered the patient to be fed regularly every hour with two or three tablespoonfuls of well prepared porridge, or gruel made of sweet-milk and wheat flour, alternating every third dose with an equal quantity of beef-tea, seasoned with chlorate of potassium instead of common salt, and for medicine, directed sulphate of quinine 0.130 grams (gr. ii) every four hours, alternated with oil of turpentine and tincture of opium, each 0.5 cubic centimetre (8 minims), in the form of an emulsion and immediately stopped all further use of alcoholic liquids. I had not then learned the value of strychnia and the mineral acids in such cases, or I would have given them instead of the quinine. As this was the first time that I had ever come so directly in practical contact with the question whether alcohol is a supporting or non-supporting agent in the advanced stage of typhoid fever, you may be certain, gentlemen, that I watched the patient during the next forty-eight hours with an uncomfortable degree of anxiety. At each of my frequent visits I approached the patient with trepidation, lest the predicted sinking and collapse might meet me there. But they never came. On the contrary, at the end of twelve hours, I could detect some improvement, both in the inspirations and the strength of the pulse. This improvement continued very slow but steady, and was sufficient at the end of forty-eight hours to relieve me of any further oppressive anxiety. In about eight days, being the early part of the fourth week of confinement, convalescence had fairly commenced, and the patient made a good recovery.

The other case, the essential features of which I will relate in as few words as possible, came under my observation only a few weeks since. The patient was a young man who had passed through a protracted course of typhoid fever, partially convalesced, and relapsed, with all the typhoid and enteric symptoms severe. I was called to see the patient in consultation about eight days after the commencement of the relapse. Found him considerably emaciated; face pale; expression dull; a little sordes along the edges of the lips and teeth; some coating on the back part of the tongue, but the mouth generally moist; the skin generally over the trunk and extremities most of the time moist, with brief spells of more profuse sweating, and feebleness of capillary circulation; the pulse soft, weak, and from 100 to 110 beats per minute; respirations variable, but averaging about 20 per minute, and attended by less than the normal degree of expansion of the chest with each inspiration; resonance on percussion fair over the anterior part of the chest, but much diminished posteriorly; a mixture of dry and moist sounds detected over nearly all parts of the chest by auscultation, with a predominance of the sub-mucous rhonchus. Both hypochondriac regions were full; in the left there was considerable enlargement of the spleen, as shown by increased area of dullness by percussion and by detecting its edge projecting a little below the margin of the ribs by the touch. The urine was much less than natural, and was stated to have been much of the time moderately albuminous since the relapse. The intestinal evacuations were near the color and consistence of cream, pretty copious, and numbered from three to six in the twenty-four hours, but no tympanitic distension of the abdomen.

The hearing was slightly impaired; the mind torpid or inactive, slightly wandering at times, but easily aroused, yet difficult to maintain conversation or connected thought. The temperature in the axilla had varied during the preceding twenty-four hours from 39° to 40° C. (102.5° to 104° F.) The extent of passive infiltration or obstruction in the lungs, the enlargement of the spleen, the quantity and quality of the intestinal

discharges, the small quantity and albuminous character of the urine, and feebleness of the circulation, taken in connection with the degree of emaciation and the duration of his sickness, rendered the prognosis very unfavorable. The patient had been diligently supported by nourishment consisting of milk, beaf-tea and eggs, with which he also took 15 c. centimetres, or half an ounce of brandy every two hours, making 180 c. centimetres (℥vi) in the twenty-four hours. He had taken it nearly at the same rate during the seven or eight days since the relapse. He was also taking two-grain doses of quinine every four hours, with an emulsion of turpentine and laudanum between to control the intestinal discharges, and a solution of acetate of potash to increase the action of the kidneys. As the treatment had been instituted and thus far carried on by two excellent physicians, whose opinions were entitled to full respect, I did not feel disposed to abruptly demand a change in regard to the use of the brandy, more especially as the previous consulting physician was not able to be present. I consequently suggested no changes, either in medicine or nourishment, except the addition of strychnia and nitric acid, in moderate doses, every four hours, in hope of improving the sensibility and tone of the nervous and muscular structures. The case progressed for three or four days with no marked changes, except the intestinal discharges became gradually less frequent and darker color, the urinary secretion was variable, sometimes quite free and again scanty, with a large excess of phosphatic deposits; the temperature also varied one or two degrees every twenty-four hours, but at no time rose above 40° C. (104° F.). The circulation and respiration, however, became gradually more impaired by the steady increase of passive infiltration in the lungs, more feebleness of pulse, and more relaxation and sweating. During the fourth or fifth night after my first visit, the symptoms of exhaustion became so alarming that the nurse gave, on his own responsibility, an extra amount of brandy over that I have mentioned. When I met the attending physician the following morning, we learned that the patient had passed a rather restless night, had two thin intestinal evacuations, had passed very little urine and none had accumulated in the bladder, but had spells of profuse sweating, accompanied by symptoms of great feebleness.

The whole cutaneous surface was still wet with a cool, clammy sweat; pulse very weak, and circulation in the smaller vessels slow and imperfect, respiration short, with very little expansion of the right side of the chest; and no evidence by auscultation that the air-cells of the lung were inflated during inspiration; diminished resonance over the whole of that side of the chest, and the posterior part of the left, but considerable inflation, with sharp sub-mucous rhonchi in all the anterior and lateral part of the left lung. The systolic action of the heart was short and weak. The aspect of the patient was such as to render it probable that he would not live another day unless some improvement could be made in the functions of respiration and circulation. Being fully satisfied that the alchohol in the brandy he was taking, by its anæsthetic effect on the nervous structures, and its interference with the decarbonization of the blood, was positively adding to the embarrassment of the respiratory and circulatory functions, I advised that the quantity given should be immediately diminished one-third, while the strychnia, nitric acid and emulsion should be continued, and an effort made to improve the circulation and check the sweats by the tinctures of digitalis and belladonna—two parts of the former to one of the latter—given in doses of one cubic centimetre (15 minims) every three hours. This advice was strictly followed, and instead of any "*sinking*," as so many anticipate from the lessening of the quantity of brandy, the next

morning there was a notable improvement in both the respiration and circulation. The patient had rested more quiet, the sweating being much diminished and the urine increased in quantity. The sub-mucous rhonchi were some less in the left side of the chest, and a little more expansion of the right by inspiration.

The quantity of brandy was still further diminished one-half, and in two days it was discontinued altogether; in all other respects the treatment was continued the same.

The respiration and circulation continued to improve slowly for two days, and subsequently very rapidly with coincident improvement in all other respects, and in four or five days convalescence was fairly established. I have thus briefly related to you the first and the last cases of typhoid fever in which I have had opportunity for carefully noting both the effects of giving alcoholic remedies regularly and efficiently, and the effects of their entire discontinuance at an advanced and critical stage of the disease. During the quarter of a century or more that has intervened between these two cases, I have had many similar opportunities for studying the effects of these remedies at the bedside of fever patients, and almost uniformly with similar results. The only exceptions were three cases characterized by morbid vigilance or sleeplessness, mental anxiety, rapid pulse, and muscular trembling.

In these, pretty full doses of diluted alcohol, given in the form of milk punch, produced sufficient anæsthetic effect to induce sleep and quiet the undue nervous excitability, after which it was gradually withdrawn. But the use of almost any other reliable anæsthetic would have produced the same results. I repeat, therefore, that in all ordinary cases of typhoid or other general fevers, the continued use of alcoholic remedies, either fermented or distilled, from day to day, instead of strengthening the action of the heart and sustaining the functions of the system, positively adds to the embarrassments of respiration and capillary circulation and diminishes nerve sensibility, thereby favoring both passive congestions in the lungs, spleen and kidneys, and fatty degeneration in the muscular structure of the heart. The third group of local diseases that should engage your constant attention while attending cases of typhoid fever, are found in the alimentary canal and mesentery. But we must take still another hour to complete the consideration of this important subject.

LECTURE XIV.

Typhoid Fever Concluded—Treatment, Complications and Sequalæ.

GENTLEMEN: At the close of the lecture yesterday I was about to direct your attention to the indications for treatment specially presented by the pathological changes in the alimentary canal which accompany most of the cases of typhoid fever. The most important of these changes, as I have already described to you, consist in asthenic inflammation, tumefaction, softening and ulceration of the aggregated and solitary glands of the lower half of the ilium, the enlargement and softening of the mesenteric

glands, the spleen, and in a lesser degree the liver. Of these, the disease of the glands in the mucous membrane of the intestine is of paramount importance both on account of the interference with the nourishment of the patient and the exhausting diarrhœal discharges that generally accompany it. Yet many of the writers and teachers of the present day appear to inculcate the idea that these extensive morbid changes in the ilium are only the efforts of *nature* to eliminate the supposed fever poison through the glands of Payer and Brunner, and consequently the resulting diarrhœal discharges are to be encouraged rather than repressed, especially during the first week of the patient's confinement.

There is no more evidence, however, that the inflammation and other destructive changes in these glands have anything to do with the elimination of a specific fever poison, than there is that the inflammation of the fauces and glands of the neck in scarlatina is a conservative effort of nature to eliminate the poison of that disease, or that the contagium of measles escapes from the irritated mucous membrane of the nostrils and bronchial tubes.

If the disease of the glands of Payer and Brunner served the purpose of eliminating from the blood a specific fever poison that had induced the general fever, then the earlier they become involved in any given case and the more free the diarrhœa during the first week, the shorter and milder should be the subsequent progress of the disease. But neither my own clinical experience nor the recorded observations of others show any such result. On the contrary, it may be stated, as a general rule, that the earlier the indications of intestinal disease appear in the progress of the general fever and the more copious the diarrhœa, the more severe and protracted will be the course of the general disease. The proper course is to regard the pathological changes in the ilium, mesentery, and other abdominal organs, as important complications of the general fever, capable by their extent and severity of adding much to the danger of fatal results, and consequently to be watched for and early met by such remedies as are capable of limiting their extent and mitigating their severity.

In selecting remedies to counteract these intestinal lesions, you must remember that their special characteristics are strictly asthenic. We have first passive congestion from impaired tonicity of the vessels, accompanied by aplastic exudation and tumefaction; next softening of texture, and third ulceration, disintegration or sloughing, accompanied throughout by morbid sensibility, and generally by increased peristaltic motion. To counteract these pathological conditions you must bring to your aid such remedies as will increase the natural tonicity or contraction of the vessels, and at the same time lessen both the morbid sensitiveness and exaggerated peristaltic motion. The use of some anodyne conjointly with, at first (in the incipient stage) small doses of mercurials or iodine; next with one of the mineral acids, nitrate of silver, or oil of turpentine, and throughout the middle and later stages, the last mentioned remedy and strychnia, fulfills the rational indications presented better than by any other means with which I am acquainted. The object is not merely to lessen the amount of the intestinal discharges, but to limit or arrest certain dangerous pathological changes in the glandular structures both within and without the intestines. This cannot be done by a simple styptic or astringent influence. If it could, any of the stronger astringents, as tannin, gallic acid, acetate of lead, or persulphate of iron would answer our purpose. These, however, tend to check secretions generally and are productive of more harm than good, except when used temporarily for the arrest of actual hemorrhage. But the mineral acids, nitrate of silver, oil of turpentine, and strychnia, improve the tonicity of

the smaller vessels, lessen passive congestion and exudation, and arrest the tendency to softening and disintegration, by increasing the general property of the tissues, called vital affinity, or by increasing the vaso-motor nervous influence, or by both. Hence they improve natural secretory action while they lessen unnatural discharges from passively congested tissues. The distinction I here make is one of much practical importance, and yet I fear it has been often overlooked.

The fifth and last general indication or object that I have named to you as requiring the constant attention of the practitioner while managing the treatment of typhoid fever, is, to sustain the patient with nourishment suitably adjusted, both in quality and quantity, to the different stages of the disease. The accomplishment of this object in the best manner, requires a correct knowledge of the constituents of different articles of food, the facility with which they can be taken up from the surface of the stomach, duodenum and first half of the small intestines, with little or no fecal residue to pass over the more irritable and diseased surface of the ilium, and the readiness of their conversion into the nutritive constituents of the blood capable of being applied to the repair of wasting tissues. The following brief propositions may aid you in the study of this subject. First choose such articles for nourishment as, either separately or conjoined, shall contain all the elementary constituents entering into the composition of the blood and organized structures of the human body. Second, the article or articles selected should be so prepared, that when taken into the stomach they are capable of being taken up and assimilated with but little influence from the gastric and other secretions usually required for the digestion and absorption of ordinary food in health, because these secretions are generally much diminished, especially during the middle and later stages of the disease.

Third, the quantity given at any one time should be so limited that it will be all absorbed or assimilated before any part of it has time to undergo fermentation or putrefactive changes by which the tympanites, and the irritation of the glandular patches in the ilium, might be increased; and yet the aggregate quantity given in the twenty-four hours must be sufficient to afford the patient a fair degree of support.

The practical application of this rule requires, on the part of the attending physician, a discriminating judgment founded on an accurate knowledge of the condition of the digestive organs of his patient, and entire faithfulness on the part of the nurse.

I have sometimes thought that more typhoid fever patients had been lost from errors in feeding than in the administration of medicines. At one time they are starved to death on beef-tea and so-called beef juices and essences, which contain little else than the water, soluble salts, and aroma of the meat; and at another they are literally stuffed daily with enough beef-tea, milk, egg-nog, and brandy or whiskey punch, to give a healthy day laborer a fit of indigestion. You cannot exercise too much care in avoiding both these extremes. As a general rule, well prepared meat broths from either beef, mutton or chicken, suitably seasoned with salt, constitute the best nourishment during the first three or four days after the patient takes to his bed, and the quantity allowed to be taken at one time may be safely left to the inclination of the patient. After this, milk should be alternated with the beef-tea or used altogether as a substitute for it; and so soon as the patient begins to exhibit that mental dullness which makes him indifferent or averse to taking food, the nourishment should be given at stated intervals and in prescribed quantity as regularly as the administration of medicines. In the middle and later

stages of the disease, when the bowels are more or less tympanitic and the intestinal discharges thin and frequent, the milk should be boiled and, while boiling, a little wheat flour added with brisk stirring to prevent its forming lumps, and give it the form of a thin, homogenious milk and flour gruel. From two to four tablespoonfuls of this may be given every one or two hours, and it constitutes the best nourishment for such cases that I have been able to devise. It contains all the elements necessary to supply the waste of the blood and tissues in small compass, bland and soothing to the mucous membrane, and easily assimilated. For drinks, nothing is better than milk-whey, fresh buttermilk, and cold water, given in small quantities but sufficiently often to keep the mouth, tongue and fauces from becoming too dry. When there is much muttering delirium with subsultus, or unusual drowsiness, tea and coffee, as pure excitants of nerve-sensibility, will constitute valuable drinks.

Some of you may be surprised that I have not included in the list of important objects to be accomplished in the treatment of typhoid fever, that of controlling the temperature by antipyretics. The omission is only apparent, however. The increase of temperature being simply a symptom or result of those complex molecular and functional disturbances produced by the action of the predisposing and exciting causes on the blood and general properties of the tissues, the only rational and curative mode of controlling it, is by removing the further action of such causes, and restoring the disturbed molecular and functional actions to their normal condition, as I explained in the preceding lecture, while speaking of the first, second and third objects requiring your attention. To seize upon one leading symptom of a general acute disease involving many important morbid processes, and make its control the principal object of treatment, without any regard to the morbid processes on which it depends, is both unphilosophical and often attended by bad results. You might with the same propriety fix your attention on the diarrhœa that so generally attends the middle and advanced stages of the disease, and endeavor to control it by opiates, astringents, or whatever would most speedily suppress it, without regard to the special character of the morbid processes in the intestines by which it was produced, as to take your clinical thermometer in hand and undertake to arbitrarily control the temperature of your patient by cold baths, quinine, digitalis, salicylic acid, or whatever else would most speedily reduce it within the desired limits, without regard to the effect of your remedial agents, or antipyretics, on the blood, the nervous centres, or any of the other important processes involved. Do not infer, gentlemen, that I am undervaluing either the use of the clinical thermometer or of the various remedies called antipyretics. The introduction of the former into use at the bedside has added much to the accuracy of our knowledge concerning the range of temperature in acute diseases, and the connection of that range with important pathological conditions, and the new modes of using the latter have led to much better results than the prevalent method of stuffing almost all continued fever patients with wine, egg-nog, and whiskey or brandy punch, that immediately preceded it. This latter fact, however, does not prove that these *better results*, are as good as might be obtained by a more discriminating use of remedies. I would warn you against trusting too exclusively to the guidance of the clinical thermometer on the one hand, and the too indiscriminate application of powerful remedial agents to the control of a single symptom on the other. I have seen several fatal cases of typhoid fever in which the daily use of the thermometer by the attending physician failed to make a single registration above 40° C. (104° F.).

One of these died from perforation of the intestine at the end of the fifth week from the commencement of the disease.*

That the arbitrary use of antipyretics is often accompanied by dangerous results, I have abundant evidence from direct clinical observation. It is only a few months since I saw a case of uncomplicated typhoid fever, in the second week of its progress, in which a cold pack was directly followed by a protracted chill and the development of a dangerous degree of pneumonia. Within the last three or four years I have been called to three cases under the care of three different practitioners, in which 0.66 grams (gr. x.) of sulphate of quinine had been given every hour until 2.0 grams (gr. xxx.) had been taken to reduce the temperature, twice in the twenty-four hours, for a week in succession. Two of the patients were adults, the other a child of about twelve years. In each case, at the time of my visit, which was from three to five hours after the last dose of the quinine had been given, the patients were found in a dorsal position, limbs extended, features relaxed and pale, profoundly deaf, the respiration so feeble that the motion of the chest was hardly perceptible, and the circulation alarmingly feeble; yet in neither case was the temperature below 38°3. C. (101° F.).

By omitting the further use of quinine and substituting therefor small doses of strychnia and nitric acid, with such other remedies as the condition of the intestinal discharges and urinary secretion indicated, the more dangerous symptoms disappeared during the succeeding twenty-four hours, and in due process of time the patients recovered. I have also seen a number of cases in which the most alarming symptoms of prostration accompanied the use of salicylic acid in the second week of the progress of the general fever.

One of these occurred in one of my own wards of the Mercy Hospital. A laboring man, aged about 30 years, during the first half of the second week of his confinement, had been taking 0.66 grams (gr. x.) of salicylic acid in solution with bicarbonate of soda, every four hours, when his pulse went rapidly down to 45 beats per minute, with all the accompanying symptoms of great exhaustion. The remedies were changed, and the symptoms of extreme depression slowly disappeared. After two or three days, the temperature of the patient being too high, and not feeling certain that the previous bad symptoms had been caused by the salicylic acid solution, its use was resumed, and in about forty-eight hours the same symptoms were again suddenly developed. Of course, the further use of the remedy was omitted; the disease continued through a protracted and severe course, but finally ended in convalescence. If by these observations I can induce you to faithfully use your clinical thermometers as the most accurate mode of determining the temperature of your patients, that you may carefully compare it with the progress of the morbid processes on which it depends; and to so study the modus operandi of the several antipyretics, that you may see clearly which is best adapted for the removal of such morbid processes and conditions as may give rise to an increase of the sensible heat or high temperature, I shall have conferred a great benefit, both upon you and your future patients.

Having thus led you through a detailed, and perhaps tedious, analytical study of the several important indications to be fulfilled or objects to be accomplished, in the treatment of typhoid fever, for the purpose of ena-

*Dr. Frantzel has recently described several cases of typhoid fever, which run their course with low temperature, but presented serious cerebral symptoms, general collapse, and sometimes gangrene of the lower extremities. See *Zeit.* für Klin. Med., Band ii., S. 217.

bling you to comprehend more fully, both the nature and extent of the morbid processes presented, and the philosophy of their management, it only remains for me to reverse this order, and by a synthetical union of indications and remedies, briefly conduct you through the actual treatment of some fair sample cases, as though we were at the bedside of the patients. When called to a fair typical case of typhoid fever during the first one or two days after the patient has taken to his bed, presenting the symptoms I have already described to you as belonging to that stage, I endeavor to secure the best possible hygienic surroundings for the patient, by fresh air, strict cleanliness, and two or three times a day a sponging of the cutaneous surface with water at such temperature as is most agreeable to the patient. For still further modifying the general disturbances of secretion and excretion I order the two following prescriptions:

℞ Hydrargyri Chloridi Mitis, 0.40 grams gr. vi.
Pulveris Opii Compositi, 2.00 " " xxx.
Potassii Nitratis, 2.00 " " xxx.
Mix, and divide into six powders, one to be given every four hours.

℞ Liquoris Ammonii Acetatis, 60. c.c. ℥ii.
Spiritus Ætheris Nitrosi, 60. c.c. ℥ii.
Mix, and give 4, c. centimeters, or one tea-spoonful every four hours between the powders.

After continuing these remedies for twenty-four hours, if there have been no evacuations from the bowels, I order an enema of warm water, holding in solution a little common salt, or sulphate of magnesia, which will usually procure one or more free evacuations. If it is not convenient to have an enema administered, a mild saline laxative may be given by the mouth. The further use of the powders is limited to one every evening for two or three nights, after which they are entirely omitted. As soon as the bowels have been fairly moved, either spontaneously or by the use of the mild laxative measures just mentioned, I direct a solution of chlorate of potassium with hydrochloric acid in gum arabic water, in such proportion that 15 cubic centimeters (℥ss.), or one table-spoonful, will contain from 0.33 to 0.50 grams. (gr. v. to gr. viii.) of the chlorate, and the same number of minims of the hydrochloric acid, and have this amount given every four hours, alternating with the liquor ammoniæ acetatis, and the spirits of nitrous æther. These remedies and such frequent sponging of the surface with water as the heat and dryness may indicate, I continue so long as the abdominal tympanitis remains only moderate, and the intestinal discharges do not exceed one or two in the twenty-four hours. In many mild cases the patients pass through the disease to an early convalescence with no other medication. But the more severe cases seldom reach the end of the first week after taking to the bed, without showing increased fullness of the abdomen, more dryness of the tongue, and an increase of the intestinal discharges. As soon as these symptoms make their appearance, I omit the further use of the prescription containing the liquor ammoniæ acetatis, and substitute in its place the following emulsion:

℞ Olei Terebinthinæ, 12. c. c. ℥iii.
Olei Gaultheriæ, 2. " " ℥ss.
Tincturæ Opii, 15. " " ℥iv.
Pulveris Acaciæ, Sacchari Albi } àà 25. grams. ℥vi.
Rub together thoroughly, and add
Aquæ 120. c. c. ℥iv.

Mix thoroughly and give 4 cubic centimeters (℥i), or an ordinary teaspoonful every three, four, or six hours, according to the frequency of the discharges. If this emulsion is faithfully prepared in the manner I have just stated, it is not unpleasant to take and very rarely disagrees with the stomach or irritates the urinary passages, even when continued for ten days or two weeks without interruption. And in nine cases out of every ten, if its use is commenced as early as I have indicated, and continued judiciously, it will do more to limit the extent and finally arrest the progress of the morbid changes taking place in the intestines and glands of the mesentery than any other remedies that I have used. Yet, I occasionally meet with a case in which the oil of turpentine either offends the stomach or causes painful micturition ; and if either of these effects follow its administration, I immediately discontinue it and give instead one of the following formulæ:

℞			
	Argenti Nitratis	0.66 grams	gr. x.
	Extracti Hyoscyami	2.00 "	" xxx.
	Pulveris Opii	2.00 "	" xxx.

Mix intimately and divide into pills xxx ; one of which may be given just as often as you would otherwise give a dose of the emulsion.

Or, ℞			
	Acidi Sulphurici Aromatici	15. c.c.	℥iv.
	Magnesiæ Sulphatis,	15. grams.	℥iv.
	Tincturæ Opii,	15. c.c.	℥iv.
	Aquæ,	120. "	℥iv.

Mix and give four cubic centimeters (fl. ℥) or one teaspoonful in a little additional water, every three or four hours, instead of the pills or emulsion. You will perceive that each of these three formulæ combine two leading properties: one capable of increasing the tone of the congested vessels in the diseased glandular structures without checking any of the important secretory and eliminative processes; the other capable of directly lessening the morbid excitability of the same structures and thereby lessening the morbid intestinal discharges. Their administration should be so graduated in size of dose and frequency of repetition as to limit the intestinal evacuations as near as possible to one or two in the twenty-four hours until they become consistent and natural. If it should happen that the evacuations from the bowels entirely cease for twenty-four or thirty-six hours at any time after the commencement of the second week, do not commit so great a blunder as to administer a dose of physic to provoke them. In such cases nothing more is necessary than to suspend the use of the restraining measures, or at most administer a warm water enema. The giving of even the mildest physic in the advanced stage of typhoid fever is always attended by danger to the patient. It is only a few weeks since that I was called to see a young man who had passed nearly through a pretty severe course of the fever, and defervescence had actually commenced, when, on account of the failure of the bowels to move for thirty-six hours, a moderate dose of sulphate of magnesia was given, which not only operated promptly and freely, but was followed by a renewal of tympanites and intestinal discharges so frequent and persistent that fatal exhaustion was induced in a few days. If the measures I have now indicated fail to exercise sufficient control over the general febrile condition and at any time during the latter part of the first or in the second week the temperature rises to 40° C. (104.5° F.) accompanied by some delirium, restlessness, quick pulse, and dryness of the mucous membrane of the mouth and air passages, I wrap the patient in a wet sheet and keep up refrigeration by

frequently sprinkling the sheet with cold water until the temperature falls to 39° C. (102.5° F.). This process may be resorted to once or twice in the twenty-four hours in aid of the ordinary sponge baths, so long as the temperature continues to rise for any considerable part of the day above 40° C. (104.5° F.).

If from the inherent gravity of the disease or the neglect of proper measures in the earlier stages of its progress, the patient begins to exhibit a low, muttering delirium, or a dull, drowsy mental condition, with more or less subsultus, a quick, weak pulse, a slowness in expelling the urine, or an imperfect control over the sphincters of the rectum and bladder, I promptly direct the administration of strychnia and nitric acid, and generally in accordance with the following formula:

℞ Strychniæ,	0.066 grams.		gr. i.
Acidi Nitrici,	4.	c.c.	ʒi.
Tincturæ Opii,	15.	" "	ʒiv.
Aquæ,	105.	" "	℥iiiss.

Mix and give 4 cubic centimeters (ʒi), or a teaspoonful in sweetened water every three, four or six hours, according to the urgency of the symptoms. At the same time the administration of such nourishment as I have already indicated should be faithfully attended to. The region of the bladder should be examined at every visit, and if it fails to empty itself completely the catheter should be used at proper intervals.

If the abdomen remains very tympanitic and the intestinal evacuations too frequent, a dose of the turpentine and laudanum emulsion may be given between the doses of the strychnia solution, until those symptoms are sufficiently restrained.

If, finally, signs of defervescence begin to appear, and all the bad symptoms abate, do not discontinue your remedies suddenly, but simply lengthen the interval between the doses from time to time until convalescence is fully established and the urinary and intestinal discharges have become natural in quantity and quality. The foregoing brief outline of treatment, coupled with the previous full discussion of the indications to be fulfilled, both in the typical and untypical cases, is sufficient for all ordinary purposes. But there are some important symptoms or complications that occasionally present themselves during the progress of typhoid fever, the management of which needs some attention. For instance, there are cases in which diarrhœa and other abdominal symptoms are prominent from the commencement. In such cases, instead of giving the chlorate of potassium and hydrochloric acid, I direct at once the turpentine and laudanum emulsion or some one of the formulæ for allaying the intestinal irritation, and for an antiseptic and alterant to modify the general properties of the tissues, iodine may be given in solution with iodide of potassium, as in the following formula:

℞ Iodinii	0.5 grams.		gr. viii.
Potassii Iodidii	2.0	"	" xxx.
Aquæ Puræ	30.0 c.c.		" ℥i.

Mix, and give from 0.3 to 0.5 c. c. (minims 5 to 8) every six hours, in a tablespoonful of sweetened water. In all grave cases of the general fever, the action of the kidneys should be noted carefully, and if the urine either becomes very scanty or albuminous, or both, an infusion of digitalis leaves, holding in solution acetate of potassium, administered in fair doses once in four hours, will be found one of the best remedies. The

giving of this need not interfere with the use of any other remedies indicated in the case at the same time. Sometimes, in the advanced stages of the fever, the patient becomes subject to profuse and exhausting sweats, coincident with scanty urine and feeble pulse. To check this I have found a combination of the tincture of digitalis, two parts, with one part of the tincture of belladonna, given in doses of 1.5 cubic centimetres (minims xxv.) every two, three or four hours, more promptly efficient than anything else that I have used. I have also found this same combination useful in lessening the extreme tympanitic distension of the abdomen, from apparent loss of action in the muscular coat of the intestines, in two cases recently under my care in the Mercy Hospital. You will remember that when speaking of the symptoms of typhoid fever, I stated that some rare cases were met with, in which, instead of dullness and drowsiness, we had morbid vigilance or constant wakefulness, with nervous agitation, and sometimes delirium.

To allay these unpleasant symptoms I have given the tincture of digitalis and chloroform, each 0.5 to 1.0 c. c. (minims viii. to xv.) every two or three hours, with the effect of soon inducing quiet sleep and a marked improvement in the general symptoms. In milder cases of the same kind, pretty full doses of hyoscyamus and camphor have been sufficient to procure the needed rest, especially when given in the evening.

Intestinal Hemorrhage. The occurrence of true intestinal hemorrhage as distinguished from the simple intermixture of a small quantity of blood with the fecal evacuations, is not of frequent occurrence, though occasionally met with at any part of the progress of the disease after the middle of the second week. Its occurrence is always an unfavorable indication, and generally leads to a speedy and fatal collapse. The blood, when voided, is generally very dark color, partially coagulated, and emitting an offensive odor. For arresting the hemorrhage, oil of turpentine, acetate of lead, gallic acid, ergotine, and nearly all the more important vegetable astringents, have been given both by the mouth and rectum, and sometimes with success. In the few cases that have come under my own observation, better success has attended the administration of the persulphate of iron in doses of 0.130 grams (gr. ii) dissolved in water, every hour; at the same time continuing the ordinary use of the turpentine and laudanum emulsion.

Perforation of the Intestines. The extension of the ulcerative process in some one of the aggregated glands of the lower part of the ilium, so far as to cause perforation of all the coats of the intestines, and the production of general and speedily fatal peritonitis, is liable to occur at any time during the last stage, or even in the convalescence, of protracted cases of typhoid fever. This accident or complication is certainly not of frequent occurrence, as I have met with but two instances in my own patients during the whole period of my practice. The first of these occurred in 1851, in the person of a young man who was studying medicine. He had passed through a regular course of typhoid fever, and convalesced at the end of the third week. After progressing with his convalescence nearly a week apparently well, and being up a part of each day, he was taken suddenly with very sharp pains in the central part of his abdomen, followed by a great sense of prostration, a very quick and weak pulse, rapid increase of tenderness and distension of the abdomen, and all the symptoms of general peritonitis, under which he died in less than forty-eight hours. The other occurred during the fourth week of a severe case, before any signs of convalescence had appeared. The treatment of such cases consists mainly in the administration of opiates sufficient to hold the intestines quiet and

lessen the pain, in the hope that adhesive inflammation may be set up in the peritoneal surface around the perforation, and by quickly causing the parts in contact to adhere together, prevent the contents of the intestine from becoming diffused in the peritoneal cavity generally, and thereby so limit the progress of the inflammation as to afford the patient a chance of recovery. It is possible that some cases have terminated thus fortunately. But as a general rule, perforation of the intestines in connection with typhoid fever, has proved speedily fatal in despite of any treatment hitherto adopted.

Sequelæ. The three most important pathological conditions liable to result from a severe and protracted course of typhoid fever, are chronic diarrhœa from imperfectly repaired ulcerations in the ilium; permanent impairment of the capacity of the lungs for air through failure to regain the full expansion or reopening of the air-cells in those parts of the lungs which had suffered either from protracted hypostatic infiltration, or more likely from a low grade of pneumonic exudation during the progress of the fever; and a condition of general debility characterized by loss of power of endurance and almost constant tendency to constipation and moderate inactivity of secretions generally, without any well defined local disease. Such patients usually say they feel very well as long as they refrain from any active labor, but tire out as soon as they commence work. I have traced many such cases back directly to attacks of typhoid fever that had occurred several years previously. It has seemed to me that in these cases the various organized tissues had never regained the full activity of the elementary properties that govern those molecular changes which are concerned in nutrition, secretion and innervation. Consequently all these processes and functions are conducted on a lower grade of activity than natural. Yet most of this class of patients are almost constantly dosed, either with supposed cholagogues, to act on the liver and remove "biliousness," or with some kind of alcoholic "bitters" to promote strength and appetite, or both alternately. Under such treatment they generally get gradually worse from year to year. There are two rational indications to be fulfilled in the treatment of these patients, namely, to increase the tone and sensibility of the nervous and muscular structures, and to promote cell growth or molecular change. To fulfill the first I give a pill containing strychnia 0.002 grams (gr. 1-32), sulphate of iron 0.064 grams (gr. i) before each meal-time; and for the second, the syrup of the lacto-phosphate of lime 4 cubic centimetres (fl. ʒi.) after each meal. If the bowels are decidedly costive, pulverized aloes 0.016 grams (gr. ¼) may be added to each pill during the first week. The continuance of these remedies, with a proper supply of good air, very moderate but regular out-door exercise daily, and a fair variety of plain food, for two or three months, has seldom failed to re-establish a fair grade of health and strength.

The second class of patients named as recovering imperfectly after typhoid fever, had their disability founded on an imperfect restoration of the air-cells, after protracted closure from infiltration or exudation during the middle and later stages of the general fever. The exact condition of the affected portions of the lungs appears to consist in hypertrophy of the connective tissue with obliteration of many of the air-cells, constituting a condition styled by the writers of a former generation, CARNIFIED.

The patients suffer chiefly from inability to take active exercise without shortness of breath, and from the ordinary consequences of habitually imperfect oxygenation and decarbonization of the blood. The pathological change of structure being permanent, the treatment must be altogether palliative; and consists mainly in adjusting the daily exercise and diet of the

patient to his actual capacity for enduring the one, and assimilating the other. If the defect is only moderate in amount, the health of the patient may remain in *statu quo* for many years. But if the impairment of structure is extensive, it is very liable to cause further degenerative changes, especially of a fatty or caseous character, bringing the symptoms and consequences of one form of phthisis.

Some degree of chronic diarrhœa, as a sequel of the general fever, is met with more frequently than either of the other defects of which I have just spoken. You must remember that defervescence often takes place while there is still considerable looseness of the bowels, and it is not very uncommon to see one or two soft or semi-fluid evacuations for several days after the patient appears to be convalescent. If this is neglected and a liberal diet allowed, the patients will gain slowly in flesh and strength, and in a few weeks get about their ordinary business, though still having from one to three loose stools per day, and not feeling as strong as they think they ought to. After two or three months, instead of having fully recovered, they find themselves losing both in flesh and strength, and are again compelled to seek medical advice.

It is now found that they are having a regular chronic diarrhœa. The stools are generally thin, greyish or reddish brown in color, and occurring from one to four or five times in the twenty-four hours, and are usually accompanied by little or no pain. In some, nearly all the evacuations take place in quick succession during the morning, and the bowels remain quiet the rest of the day. In others, an evacuation follows almost immediately after each meal, as though the presence of food in the stomach excited an undue peristaltic movement throughout the whole length of the alimentary canal. Occasionally you will meet with a case that presents regular alternations of costiveness and diarrhœa; the bowels remaining quiet from two to three days, with an increasing sense of fullness or discomfort, and then free diarrhœal discharges for one day, or until the contents of the bowels have been fully discharged. During the war, from 1861 to 1864, a very obstinate, and sometimes fatal, form of chronic diarrhœa was often met with among the soldiers, as the sequel of protracted attacks of typhoid fever, modified by the co-existence of malarious influences, called by many "typho-malarial fever." I need hardly remind you that the diarrhœa found following an attack of typhoid fever has its origin in the continuance of a morbidly sensitive condition of the recently ulcerated glandular structures in the lower part of the ilium, and in the more severe cases the continuance of the ulcerated patches in a more indolent or chronic form; but I repeat the fact, for the purpose of again urging the importance of having the practitioner give close attention to the careful regulation of both diet and medicines through the period of convalescence, and until the intestinal discharges have become reliably natural, both in time and quality. It is far easier, by such attention, to prevent this troublesome and sometimes dangerous sequel, than to cure it after it has become established. Yet, the great majority of the cases I have met with have recovered in from two to six weeks by a properly regulated diet of milk and wheat-flour gruel, milk and light bread or crackers, and meat broths made with rice added to the meat, aided by much rest in the recumbent position, and a dose of either the turpentine and laudanum emulsion, or of the nitrate of silver, hyosciamus and opium pills each morning, noon, tea-time and at bed-time. The number of doses per day may be diminished from time to time, as the discharges become less frequent and more consistent. In such cases as had continued until the blood had become much impoverished of red corpuscles and nutritive elements, giving the

patients a very anæmic appearance, as was the case with many of the soldiers returning sick from the military camps, I obtained very good results from the administration of a powder every four or six hours, composed of sub-nitrate of bismuth 0.5 grams (gr. viii.), sub-carbonate of iron 0.2 grams (gr. iii.), and sulphate of morphine 0.011 grams (gr. 1-6). In some of the same class of patients, in which the morphine in the powders induced secondary nausea and depression, I substituted, with advantage, the use of a solution of bromine with bromide of potassium and distilled water, as in the following formula:

℞	Brominii	0.66 c.c.	M x.
	Potassii Bromidi	4. grams.	ʒi.
	Aquæ Distillatæ,	120. c.c.	ʒiv.

Mix, give 4 cubic centimetres (fl. ʒi.) or one teaspoonful further diluted, with at least a tablespoonful of water every four or six hours. The use of this remedy was first suggested to me as valuable in chronic diarrhœa and dysentery by the surgeon in charge of the hospitals in connection with the military camp on Rock Island, towards the close of the war. This, gentlemen, completes what I have thought important to say to you concerning typhoid fever, which is the most important because the most universally prevalent of all the more severe acute general diseases.

LECTURE XV.

Typhus Fever—History, Causes, Symptoms, Diagnosis, Prognosis, Special Pathology, Pathological Anatomy and Treatment.

GENTLEMEN:—Typhus fever has been recognized and described under various names, from the earliest periods of medical history.

The word typhus means dullness or stupor, and was for a long period applied equally to the typhoid fever, as to that now more distinctively recognized as typhus. It was not until the early part of the present century that the work of separating the two diseases was fairly begun and prosecuted with great care. Prominent among those who have contributed to the establishment of diagnostic differences between them are Dr. Enoch Hale, of Massachusetts, in 1833; Dr. Gerhard, of Philadelphia, in 1835; Dr. A. P. Stewart, in 1840; M. Louis, of Paris, in 1841; Dr. E. Bartlett, of Massachusetts, in 1842; Dr. Austin Flint, of New York, in 1852; and still later, Sir William Jenner, of London. The careful and extended researches of the latter have been considered sufficient to demonstrate the fact that the typhoid and typhus fevers are essentially distinct and independent types of continued fever, by a large majority of the profession. This conviction, however, is by no means universal, for there are still some who regard them as modifications of one disease caused by differences in the intensity of the action of the causes, rather than by essential and specific differences in their nature.

Assuming that typhus is a distinct form of general fever, we find the range of its prevalence much more limited than that of the typhoid type.

And it is claimed that it has its home or natural habitation in Ireland, Poland, and the Russian provinces bordering on the Baltic, as distinctly as yellow fever has in a part of the Atlantic Coast and the West India Islands. Certain it is, that no other part of the civilized world has been so frequently and generally scourged by the epidemic prevalence of typhus, as Ireland. According to Dr. Hirsch the disease was generally prevalent throughout the island from 1797 to 1803, in 1815, from 1817 to 1819, 1821 to 1822, 1825 to 1827, in 1834, 1836, 1842, and from 1846 to 1848. The same author states that during the years 1817, 1818, 1819, not less than 800,000 in a population of 6,000,000 fell sick, and 45,000 died. The deaths were not all from typhus, for a considerable number came to their death directly from famine and dysentery.

The disease not only finds a home in the localities just named, but it appears to have accompanied the Irish emigrant into almost every other country of Europe and America.

Dr. Flint tells us that it was imported from Ireland, and began to prevail as an epidemic in New York in 1861, and from that time to 1864, 1428 cases were admitted into the Bellevue Hospital alone.* I will not occupy your time, however, by any detailed history of the appearance and progress of this variety of fever in different countries, or even in our own country. It is sufficient to state that in most cases where emigrant ships have sailed, either from Ireland, or some parts of the continent of Europe, with such numbers of emigrants on board as to greatly overcrowd the ship, typhus fever has made its appearance among them before they reached this side of the Atlantic, and often caused the death of large numbers; and those who survived introduced the disease into whatever port or town they were permitted to enter.

These results were so common during the former years of active immigration into our own country, that the disease came to be familiarly styled "ship fever," or "ship typhus." New York, Boston, and Philadelphia, were the chief primary receptacles for this tide of humanity and the diseases accompanying it.

But as large numbers who were not actually sick on their arrival, took passage by railroad immediately for the *West*, or some town in the interior, some of them would commence being sick on the route, or soon after their arrival. In this way the disease has been freshly introduced into a great many localities throughout the interior of the country. I have repeatedly met with cases in this city among those who had just arrived by railroad from New York, having passed almost directly from the emigrant ship to the cars. Typhus fever, however, has been observed in many places in our country, from the severe epidemic in 1807 in New England, to the present time, and under circumstances when it could not be traced to any foreign source, or channel of communication with other infected localities.

Causes.—It is claimed by most of the writers and investigators of the present day, that typhus fever not only originates solely from a specific organic poison, but that the poison is reproduced in the bodies of the sick, constituting it a true contagion.

All agree that the disease is found chiefly in circumstances characterized by the presence of confined and foul air, caused by want of cleanliness and ventilation, overcrowding, poverty and famine. Crowded ships, jails, prisons, poor houses, asylums, manufacturing establishments, narrow and crowded streets in cities, and poorly supplied camps of armies, are

* See Practice of Medicine, by Austin Flint, M. D., fifth edition, page 971.—1881.

the places in which typhus has been found to chiefly prevail in all past periods of medical history. In other words, it is the same kind of circumstances, only existing in a more concentrated degree, that favors the development of typhoid fever, as I have already pointed out to you in the lectures on that subject. Most of the advocates of a specific typhus contagion claim that all the bad hygienic conditions to which I have alluded are only predisposing or favoring circumstances, and in no case capable of originating the disease until the specific fever *germ* has been introduced from without. Yet all such are forced to admit that absolutely nothing is known concerning the "nature, form, and condition of said germ,"* and abundant instances have been observed in which cases of the disease have occurred under circumstances admitting of no possible connection that could be traced, with any outside source of infection.

Dr. Austin Flint reported four cases of typhus that occurred in the Erie county almshouse in the winter of 1840–1, that strikingly illustrate this fact,† and many others, equally well observed and reliably recorded, might be cited, of the same import. Giving due credit to all well ascertained facts concerning the origin and spread of typhus fever, without allowing undue weight to mere theoretical opinions, I have been led to the following conclusions:

First, the disease is capable of originating from the use of an atmosphere strongly impregnated with the excretions and effluvia from the human body, without any traceable communication with other sources of infection, as in the many instances in which cases have occurred in almshouses, jails, ships, and other over-crowded places, so far isolated that it was hardly possible for any infection or specific germs to have been introduced from without and not be easily discovered. To persist in assuming that the *germs must* have been introduced from some foreign source, merely to sustain a favorite theory, is contrary to the true spirit of scientific inquiry, and is much less rational than the position so ably maintained by the late Dr. Joseph M. Smith, in his report on hygiene, in the third volume of the Transactions of the American Medical Association, namely: that the concentrated organic matter in the air of such places, by further decomposition, developed the special poison that caused the disease.

Second, the disease when once developed, is capable of spreading by contagion or direct communication from one individual to another whenever many cases are crowded together in the same hospital ward, or the air is allowed to remain unventilated in the room of a single patient. But, whenever thorough ventilation and cleanliness are maintained in the sick room, the propagation by contagion or direct communication with the sick is of rare occurrence.

Third, the essential cause or *materies morbi* that produces typhus, though originating under circumstances very similar to those giving rise to the cause of typhoid fever, nevertheless produces its effects more rapidly, causing a more profound alteration in the quality of the blood and excretions, and consequently more readily contaminating the air surrounding the sick with infectious effluvia, capable of developing the same disease in those who may inhale it.

Typhus fever is generally greatly increased in its prevalence in seasons of famine, and by all such circumstances as tend to keep either families or larger numbers closely indoors with inadequate ventilation. Consequently limited outbursts of the disease have occurred more frequently in

* See Practice of Medicine, by Roberts Bartholow, M. D., etc, etc., second edition, p. 705.
† See Boston Medical and Surgical Journal for June, 1841.

the winter or seasons of protracted cold. Otherwise it appears to be but little influenced by age, sex, or seasons of the year.

Symptoms.—The symptoms that accompany typhus from its initial stage to convalescence, are so closely analogous to those of typhoid fever, that it is only necessary to call your attention to the differences, instead of the symptoms in detail. The initial stage of typhus is shorter, usually not more than from two to five days, and is characterized by the same feelings of dullness, headache, and general indisposition, and more frequently ends in a marked chill, as the patient takes to his bed. During the first three or four days the face is more deeply suffused with a dingy redness; more congestion of the surface generally; a more rapid rise of temperature; greater frequency of pulse and respiration; and more tendency to early delirium, than in the typhoid fever. As the disease progresses, the tongue becomes more thickly coated, and changes earlier to a dark brown color, with more sordes on the lips and teeth; more congestion of the vessels of the conjunctiva; a continuance of more frequency and feebleness of pulse; and in cases marked by much stupor the pupils are often much contracted, with earlier and more marked subsultus. The symptoms referable to the respiratory organs do not differ materially from those of the typhoid disease; while those indicating disturbance of the alimentary canal are much less. In fact, there is more frequently constipation during the first week in typhus, than any degree of diarrhœa, and in many cases the bowels are disposed to remain quiet throughout the whole course of the disease. As a rule, the abdomen is much less tympanitic and more doughy or inelastic to the feel, and without gurgling; and both the eliptical plates in the ilium and the glands of the mesentary remain but little altered. Yet in quite a large proportion of the cases of typhus, the second week is accompanied by considerable diarrhœa and some tympanites. The urine undergoes the same changes as in typhoid fever, being on the average more scanty, and albumen present in a larger proportion of the cases.

As a general rule, the skin and bronchial membranes are dry, but in some cases periods of copious sweating occur at different times during their progress. Both epistaxis and intestinal hemorrhages are very rare in typhus. The average range of temperature differs but little from that of typhoid fever. It rises more rapidly and generally reaches its climax about the fourth or fifth day, when it is generally from 40° to 41° C. (104° to 106° F.), according to the severity of the case. From that time to the end of favorable cases the morning temperature is about 38°.8 C. (102° F.), and the evening 39.5° C. (103.2° F.) In the cases tending towards a fatal result the average temperature is usually one or two degrees higher. A rapid decline in the temperature towards the end of the second week generally indicates the near approach of convalescence. The average frequency of circulation is also greater, the pulse ranging from 100 to 130 per minute, and the respirations are more frequent than in the typhoid disease. The average duration of typhus is also less, being about two weeks, while the extremes vary from seven days to twenty-eight or thirty.

The defervescence is more rapid and often accompanied by critical evacuations from the skin, kidneys or bowels.

Perhaps the only symptom accompanying typhus, that has been claimed to be different in *kind* as well as in degree, from the corresponding symptom in typhoid fever, is the eruption or maculæ on the skin. Eruptions appear on the skin in a certain proportion of both forms of fever. They appear earlier in typhus, usually from the third to the fifth day, are more

copious and more generally diffused both on the trunk and extremities. They are smaller, darker colored, less elevated, and after the first few days the color does not disappear on pressure, and in bad cases, towards the close of the disease they often become petechial.

These spots, however, are often absent throughout the whole course of the disease. Dr. Murchison states that they were absent in 11 per cent. of the cases admitted to the London fever hospital. In 65 cases observed by Dr. Austin Flint, they were absent in 12 per cent. Dr. Lebert makes them absent or only slight in 20 per cent. of his cases. My own observations have led me to think that the importance of the eruptions or spots on the skin, has been greatly overrated both in typhoid and typhus. They are not only absent in very many cases, and so slight as to require close examination to find them in many more, but both kinds are sometimes present and freely intermingled on the skin of the same patient, at the same time.

Diagnosis.—You cannot fail to notice, gentlemen, that in what I have said concerning the symptoms of typhus, the differences from those of the typhoid disease, are all expressed in terms indicating *more* or *less;* that is, differences in degree and not in kind. And you will find the same characteristic in all your works on practical medicine. There is, therefore, no absolutely reliable diagnostic symptom by which all cases of typhus can be readily distinguished from typhoid fever. The strongly marked typical cases of both varities present sufficient points of difference to make them easily distinguishable. But practically the gap between these is filled by cases from both sides, less and less differing, until the symptoms become so merged and intermingled that the most experienced clinical observers are left in doubt as to which side of the diagnostic line they should be placed. Hence, M. Louis, Jenner, Flint and others who have analyzed any considerable number of cases for the purpose of proving the non-identity of the two varieties of fever, have been obliged to set aside from seven to ten per cent. of the whole number, in a *doubtful* list, or defer the completion of their diagnosis, until after a *post mortem* examination could be made.

These facts certainly show a very close relationship, if not an essential identity, between these two varieties of acute general disease.

Prognosis.—From the statistics of mortality gathered by Dr. Murchison in the leading hospitals of London, Edinburg, Glasgow, Paris, and the provinces of France, the average ratio of mortality appears to be 18.78 per cent., or 1 in 5.27. About the same results are given by Lebert, in his article on Typhus in Ziemssen's Cyclopædia of Practical Medicine. You will notice that these ratios are almost identical with those furnished from the same sources in typhoid fever. There are great differences in the ratio of mortality in epidemics occurring in different places, and in different years in the same place. In some instances only 8 or 9 per cent. have died, while in the London Fever Hospital in 1850, according to Murchison, the death rate rose to 60 per cent. As is usual in all epidemic diseases, the ratio of mortality has been found greater at the beginning than during the decline of an epidemic. It is slightly higher in males than in females; and much greater in adults than in children. There are many facts on record indicating that the mortality from typhus is greatly influenced by the amount of fresh air supplied to the patient. A single patient occupying a large and well-ventilated room, or an open tent, not only doubles his chances of recovery compared with one in a small, imperfectly ventilated room or a crowded hospital ward, but he very rarely communicates the disease to those who come in contact with him. This

was strikingly illustrated when, in 1864, the fever cases, mostly typhus, were transferred from the Bellevue Hospital in New York, to tents on Blackwell's Island. In the hospital wards the ratio of deaths had been a little more than one in six, but when over 500 had been treated in the tents, it was found that the ratio was only a fraction more than one in seventeen.

Special Pathology.—As in all other relations, so in regard to the special pathology, there is a close analogy between the typhus and typhoid forms of fever. The morbid changes in the blood, the general properties of the tissues, the processes of nutrition and disintegration, and in the functions of the more important excretory organs are in the same direction in both. It has seemed to me that the essential cause or causes of typhus acted in the same direction, but with greater intensity, than those of the typhoid disease. Consequently, in typhus we have a more rapid development of the disease, a more profound alteration in the quality of the blood, a greater depression of the susceptibility and vital affinity of the organized structures, causing earlier and more decided disturbance of nervous functions, capillary circulation and secretion, and an earlier termination either in death or recovery. When death takes place, it is more generally from the direct and extreme impairment of the quality of the blood, and of the properties of the tissues, rather than from local complications; and recoveries are more frequently marked by critical evacuations.

Pathological Anatomy.—The *post mortem* appearances presented in cases of typhus differ from those found after death from typhoid fever, chiefly in two particulars. First, the blood in typhus is more decidedly dark colored and uncoagulable, and all its constituents more impaired. This was fully demonstrated by Dr. Upham, of Boston, in a paper giving in detail the results of a large number of *post mortem* examinations in the emigrant fever hospital on Deer Island, near Boston, several years since. Second, the glandular structures in the mucous membrane of the ilium and mesentery are much less changed in typhus than in typhoid fever; and in some instances they have undergone no appreciable changes whatever. In many cases, however, the glands of Peyer have been found congested and sufficiently tumefied to render their outlines distinct, and in a few, some degree of ulceration was present.* In all other respects, the description I gave you concerning the pathological changes in typhoid fever, will apply equally well to those found after death from typhus, and consequently I need not repeat it at this time.

Treatment.—The indications to be fulfilled in the treatment of typhus, and the means for fulfilling them, are the same as in the typhoid form of fever. And as these were very fully discussed while considering the treatment of the latter disease, it would be a needless repetition to renew the discussion at this time. As the fever develops more rapidly in typhus, and the morbid changes in the blood are more prominent, so the three first objects to be accomplished in its treatment, as mentioned in relation to typhoid fever, should receive your most prompt and careful attention. To secure for each patient an abundance of good air, cleanliness, and such sponging of the surface as the dryness and heat may indicate, are measures of primary importance. General alteratives, antiseptics, and mild, laxatives are more needed, and may be given with more freedom during the first week than in the typhoid form of disease. On the other hand, as there is little or no indication of intestinal disease in the majority of cases of typhus, you will have less opportunity for giving the turpentine

* See Ziemssen's Cyclopædia of the Practice of Medicine, Vol. I., p. 334.

emulsion and other remedies recommended for relieving the intestinal complications. But in all such cases as are accompanied by too much looseness of the bowels in any part of their course, these same remedies will be found the most efficient for relieving it. In all other respects, the directions I have given you in relation to the management of typhoid fever are equally applicable to the corresponding stages of typhus.

Prophylaxis.—To prevent the propagation or spread of typhus, the utmost care should be exercised to maintain full ventilation and scrupulous cleanliness; to avoid all over-crowding or the aggregation of many patients in close proximity to each other; all excretions or evacuations should be immediately removed from the room; and no more well persons admitted to the presence of the patients than is necessary for giving them proper care and treatment.

THE PLAGUE.

The next acute general disease, to which I will call your attention, is one that has thus far never been recognized as having an existence in our country or on this continent.

I allude to the Pest, or Plague, which, previous to the middle of the seventeenth century, was one of the most severe and fatal scourges of the human race. The words Pest, Pestilentia, and Plague, were originally used to designate any severe epidemic disease; but in more modern times they are used only to designate a severe and malignant form of continued fever which has generally been supposed to have its home in Egypt, Syria, and countries bordering on the eastern shores of the Mediterranean Sea, and the rivers that empty into it. There are evidences of its having prevailed in those countries from a very remote period of antiquity. From there it repeatedly spread over Europe and Asia, but the first extensive prevalence of the disease throughout Europe of which we have a reliable history, occurred about the middle of the sixth century, and is known as the *Plague of Justinian.* During the ten subsequent centuries it frequently prevailed in an epidemic form over large portions of Europe, Asia, and Africa, and in some places destroyed more than half of the entire population during a single epidemic. Several times it visited both London and Paris. After the middle of the seventeenth century it began rapidly to recede from western Europe; and after the important sanitary improvements in and around Cairo and other parts of Egypt, under the reign of Mohamet Ali, its prevalence became so limited that it hardly attracted attention in any part of the world. It is not extinct, however, as we have accounts of its prevalence among the Arabs in North Africa in 1858 and 1859; in Mesopotamia in 1867; in Persian Kurdistan in 1871, and in some of the provinces overrun by the armies during the late war between Russia and Turkey, in the southeastern part of Europe and the border of Asia during the last two or three years.

Causes.—Liebermeister classes the Plague among the contagious-miasmatic diseases; and if we give full credit to the statements of those who have witnessed its prevalence in different places and seasons, it would appear to be capable of direct communication from one person to another by contagion, and also of being developed and propagated in the midst of impure air, uncleanness, overcrowding and famine. In these respects it bears a close analogy to typhus; and, like the latter, is very rarely contagious, except when many patients are aggregated together in dwellings or hospital wards, or where both ventilation and cleanliness are neglected in the room of a single patient.

That bad social conditions coupled with damp, ill-ventilated, and overcrowded dwellings, aided by a soil undrained, and permeated by foul water are capable of developing specific poisons of various degrees of activity or virulence, which, when imbibed by human beings are capable of producing typhus, plague, yellow fever, and perhaps other pestilential diseases, I have no doubt. That such specific poisons are also capable of being reproduced in the emanations from the bodies of those sick with the diseases named, provided they remain in bad sanitary surroundings, and under such circumstances may prove highly contagious, appears to be proved by abundant historical facts. But facts equally abundant further prove that no amount of such specific poisons can be propagated or made to spread disease in the midst of pure air and good sanitary regulations. The plague seldom prevails sporadically, but very generally assumes an epidemic form, and varies much in its severity and fatality in different epidemics. Neither age, sex, nor season of the year exert any notable influence over the development and progress of the disease.

Symptoms.—Those who regard the disease as caused exclusively by a specific organic poison imbibed from without, represent the period of incubation to be between two and seven days.

The commencement of active symptoms is generally marked by a chill, or at least rigors, which soon give place to fever characterized by pains in the head, back and limbs, much restlessness, great sense of weakness, dizziness, sometimes vomiting and purging, with inward burning and great thirst. The skin soon becomes hot and dry; the eyes injected; tongue covered with a white chalky-looking coat; pulse from 110 to 120 per minute, and breathing correspondingly accelerated; and the temperature often from 39.4° to 40° C. (103° to 104° F.) before the end of the first twenty-four hours. During the second and third days the symptoms present all the characteristics of profound typhus, and are usually followed on the third and fourth days by the appearance of inflammation and swelling of the lymphatic glands in the groins, armpits, or neck. These swellings attain a size varying from that of a pea to that of a hen's egg; and if the patient does not die before the end of the first week, suppuration in some of the swellings is apt to occur. Simultaneously with the appearance of the glandular swellings, carbuncles are also liable to appear on the back, hips and extremities. In a large proportion of cases the patients sink early into a constant delirium, stupor, or coma, with small, feeble, irregular pulse, and die between the third and fifth days. If they live beyond the first week, the fever declines, such swellings as have suppurated discharge, at first an unhealthy pus with considerable destruction of areolar tissue; and if carbuncles have formed, their sloughs begin to separate, the dryness and sordes disappear from the mouth and lips, and the patients slowly recover, though some die from exhaustion during the suppurative stage, after the general fever has disappeared. In some cases occurring during the height of a severe epidemic, the patient has exhibited sudden and extreme paleness of features, great feebleness of cardiac action, imperfect respiration, coldness of surface and extremities, and has died in a few hours without any establishment of febrile heat.

Diagnosis.—The plague is distinguished from typhus, and still more from the typhoid fever, by the greater abruptness of its beginning, the more rapid rise of temperature and greater violence of all the symptoms during the first two days, and subsequently by the appearance of pains and swellings in some part of the lymphatic system of glands, to which are added in many cases, carbuncles on the back and extremities. The

whole course of the disease is more violent, and shorter in duration, than any other variety of continued fever.

Prognosis.—As I have already stated, when alluding briefly to the history of the disease, the prognosis is extremely unfavorable, its prevalence being accompanied by a larger proportion of deaths than from any other known acute general disease.

In those great epidemics of the disease that prevailed over nearly all the known countries of Europe, Asia and Africa, in the middle of the sixth century called the "Plague of Justinian;" in the middle of the fourteenth called the "Black Death;" and about the middle of the seventeenth century, nearly three-fourths of those attacked, died. As a general rule, if the patient lives beyond the seventh day from the commencement of the attack, his chances of recovery are much improved. Neither age nor sex appears to exert any marked influence over the ratio of mortality.

Special Pathology.—All the symptoms accompanying the plague indicate the presence of some morbid material or special poison in the blood, which by its presence impairs both the quality of the blood and the properties of the organized structures of the body. Sometimes this impairment is so profound as to actually suspend molecular changes and cause the death of the patient within the first forty-eight hours. If this result is not reached, and the disease is prolonged, there is developed a special inflammation of some part of the lymphatic system of glands, most frequently in the groin or upper part of the thighs, but may occur in any part of this system of glands, either in the internal or external parts of the body.

Pathological Anatomy.—In many cases of plague, death takes place so soon after the commencement of the disease, that the evidences of morbid changes of structure in any part of the body are very slight. The blood presents the same dark color and diminished coagulability as in typhus. When death has resulted at any time after the third day in the progress of the disease, in addition to the dark and uncoagulable condition of the blood, the spleen is pretty uniformly enlarged, softened and very dark color; the mesenteric glands a little enlarged, and presenting ecchymosed spots. The latter are also often found in different parts of the mucous and serous membranes, and sometimes in the parenchyma of the more important organs. But the most constant, and apparently the most characteristic, anatomical changes are found in some part of the lymphatic glands. The enlarged and morbid condition of these glands is found in the inguinal regions, axilla, the upper part of the thighs, in the mediastinum, along the larger bronchial tubes, in the neck, in the pelvis and in the abdomen just below the diaphragm. It is not often that the glands are found diseased in all these places in the same patient; but they are pretty uniformly found enlarged and increased in vascularity in one or more places, When laid open, the diseased glands present various appearances, some being uniformly red, others white and granular, but all more or less softened, and some of them reduced to a pulpy or jelly-like consistence. I think the pathological condition of the lymphatic glands bears the same relation to the general fever in the plague, that the disease of the glands in the mucous membrane of the ilium and the mesentery does to the typhoid variety of general fever.

Treatment.—Modern writers have given us no definite instructions in regard to the treatment of this form of fever. From the virulence of the exciting cause or causes, and the rapid impairment of the quality of the blood and the general properties of the tissues which result from their

action, it is evident that a large proportion of the cases will always terminate fatally before any treatment can develop sufficient influence to arrest the progress of the morbid action. And yet, both the symptoms during life and the changes revealed by examinations after death afford certain rational indications for our guidance in the selection and application of remedial agents. These are: first, to suspend as far as possible, the further action of the causes, either by removing the patient beyond their influence or by neutralizing their effects; second, to lessen the intensity of the febrile movement, and promote natural secretory action; and third, to prevent the deterioration of the blood and the destructive changes so constantly liable to occur in the lymphatic system of glands. To accomplish the first you must secure thorough ventilation and cleanliness of the rooms occupied by the sick, and use such disinfectants as will most effectually destroy the noxious quality of the excretions and eliminations from the bodies of the patients.

To lessen the rapid rise of temperature and promote more healthy eliminations from the skin and lungs during the first two or three days, frequent sponging of the whole surface with cool water, aided, if necessary, by the wet sheet and sprinkling once or twice in the day, constitute the safest and most efficient means that can be employed. For a general alterant to sustain the molecular changes throughout the system, and to lessen the morbid action in the lymphatic glandular system, I should have great confidence in the early and persistent use of iodine internally, in the form of aqueous solution, as in the following formula:

℞	Iodinii,	0.5 grams,	gr. viii
	Potassii Iodidi,	3.0 grams,	gr. xlv
	Aquæ Distillatæ,	45.0 c. c.	℥iss.

Mix, and take one cubic centimetre or fifteen minims every three or four hours, in a tablespoonful of sweetened water.

In all other respects the details of treatment may be the same as in the more severe grades of typhus.

Prophylaxis.—The chief prophylactic measures are, thorough ventilation, cleanliness, and a proper supply of good food and wholesome water, with isolation of the sick as far as practicable.

LECTURE XVI.

Relapsing Fever—Its History, Causes, Symptoms, Diagnosis, Prognosis—Special Pathology—Pathological Anatomy and Treatment.

GENTLEMEN :—The acute general disease now familiarly known as *Relapsing Fever*, has undoubtedly prevailed at different times and in different countries from an early period of medical history, but until after the commencement of the present century it was regarded as a variety of typhus, and alluded to under various names, as typhus recurrens, febris recurrens, five-day fever, seven-day fever, bilious typhus, relapsing fever,

and mild yellow fever. The first description of it as a distinct form of fever which attracted attention, was that given by Mr. Rutty in his History of the diseases of Dublin, founded on an epidemic that prevailed in that city in 1739; and another epidemic was described by Dr. Barker, in 1801. The disease prevailed in Edinburgh in 1817–18, and was accurately described by Dr. Christison and Dr. Welsh. It was still more accurately described by Dr. O'Brien and Dr. Graves in 1826. From 1842 to 1848 it prevailed still more extensively in Ireland, Scotland and England, and it was the descriptions given of the epidemics during this period by Drs. Mackenzie, Cormack and Craigie, that gave still more prominence to the idea of it as a distinct form of fever. An epidemic of the disease appeared in London in 1847, and was made a special subject of study by Sir William Jenner who, in 1850, so clearly presented the points of differential diagnosis between it and the other forms of continued fever, that nearly all subsequent writers have assigned it an independent position among the idiopathic fevers.* Dümmler alludes to relapsing fever in connection with typhus in Upper Silesia in 1848; Engel had also made similar allusions in connection with an epidemic of typhus in Bukowina, in 1846; Griesinger still more particularly described it as prevailing in connection with what he called bilious typhoid and typhus in Cairo, and other places in Egypt, in 1850; and it prevailed to some extent in the armies of France, England and Russia, during the war between those nations in the Crimea. In 1863 it prevailed severely in Odessa, and in 1865, in St. Petersburg. In 1868 it appeared in decided epidemic form in Berlin and Breslau, and has reappeared from time to time in those cities, and other places in North Germany, until the present date.

The first cases of relapsing fever recognized in this country occurred in a company of Irish immigrants who arrived in Philadelphia in June, 1844. Fifteen of their number were admitted into the Philadelphia Hospital, and the disease with which they were afflicted was recognized and described by Dr. Meredith Clymer as genuine relapsing fever. The disease was not propagated beyond the company of immigrants mentioned, and we have no authentic record of other cases until 1850–51, when fifteen cases were observed and recorded in the Buffalo City Hospital, by Dr. Austin Flint. The patients were all Irish immigrants, six of whom had arrived within the space of five weeks; six had lived in this country between six and sixteen months; one four and one five years; while the term of residence of the remaining one is not given. It does not appear that they came from any one locality in the city, or that they had any particular connection with each other. Two were admitted to the hospital in October, four in November, eight in December, and one in January.† It is stated by Dr. Lebert that some cases of relapsing fever were introduced by Irish immigrants into New York city in 1847.‡ And Dr. Austin Flint alludes probably to the same cases when he says, "a few (cases) reported by Dr. A. Dubois, in 1848."§

Dr. Dubois, however, simply reported some cases of severe "inflammation of the eye, following typhus fever, as it appeared in the city of New York in 1847–48," in the Annalist for June, 1848. But neither in this paper nor in the communication on the same subject, furnished to the Committee on Surgery of the American Medical Association, and published in the first volume of the Transactions of that body, p. 373, for 1847, can I

* See Practice of Medicine, by George B. Wood, M. D., &c., Vol. 1, note. p. 374, fifth edition.—1858.
† See Clinical Reports on Continued Fever, by Austin Flint, M. D. p. 369, 1852.
‡ See Ziemssen's Cyclopœdia of Practical Med. Vol. I, p. 260.
§ See A Treatise on the Principles and Practice of Medicine, Fifth Ed., by A. Flint, M. D., &c., p. 982.

find any adequate proof that the fever which preceded the cases of ophthalmia reported, was any different from ordinary typhus. The first epidemic prevalance of relapsing fever, of which we have any account, commenced in the city of New York, in the last part of 1869, and continued through 1870 and the first part of 1871. The epidemic reached the climax of its prevalence in June and July, 1870; after which it rapidly declined. The whole number of cases reported to the New York Board of Health during the year 1870, was 2,121, of which 1,594 occurred during the first half of the year. During the same year the fever also appeared in epidemic form in Philadelphia, 517 cases having been admitted into the Philadelphia Hospital between April and November of that year. At the same time a few cases of the disease were observed in many of the towns near New York, but chiefly in the persons of working men who had come directly from the city.* During that year five cases came under my observation in this city, two of which were admitted into the Mercy Hospital. Several cases occurred in the practice of other physicians, but not sufficient to attract public attention or indicate the existence of an epidemic. Since 1871, I have not learned of the prevalence of this form of fever in any part of our country.

Causes.—From the foregoing statements in regard to the history and geographical distribution of relapsing fever, you cannot fail to notice how closely they correspond with that of typhus. It has not only prevailed in the same localities and among the same classes of people, but also at the same times and seasons; the two forms of fever being freely intermingled in the same epidemic. So far, therefore, as relates to favoring circumstances or predisposing causes, it must be conceded that those of relapsing fever are the same as we have already discussed in relation to the typhoid, typhus, and the plague. It is claimed to be more contagious than typhus. That it is capable of being communicated from the sick to the well under certain circumstances, appears fully proved. It is necessary that the contact with the sick should be close, as in the case of nurses and attending physicians, or that the atmosphere surrounding the sick should be impure, either from overcrowding or want of ventilation. Under such circumstances many of those coming in contact with the sick, whether physicians, nurses, or visitors, contract the disease. But when there is no overcrowding of many patients together, and the air of the sick room is kept fresh and good, there is very little tendency to propagate the disease by contagion. Only those who handle the patients or their clothing, then, contract the disease, and even they often escape. Its contagiousness is, therefore, of the same character as that of typhus. In 1873, Obermeier discovered in the blood of relapsing fever patients, during the febrile stages, what is described by Lebert as "exceedingly thin, thread-like, spiral fungi." Dr. Flint calls it a "spiral-shaped bacterium." It has been named by common consent *Spirillum Obermeieri*, and strongly resembles the spirochæte plicatilis seen by Cohn in mucus from the mouth. Similar spiral-shaped bacteria have been discovered by Ehrenberg in water; by Billroth in the fluid from noma; and by Manassein in the contents of a cyst.†

The discovery of Obermeier has been confirmed by Lebert and his assistants, Weigert and Buchwald, who found the same spirillum in the blood of all the relapsing fever patients coming under their care in the hospital at Breslau, in 1873 and 1874.

* See Report on Relapsing Fever, by Stephen Smith, M. D., in the Annual Report of the Board of Health of New York, 1870-71, p. 456.

† See Principles and Practice of Medicine, by Austin Flint, M. D., etc., Fifth Edition. p. 984.

No one of the observers, however, has thus far discovered any of these minute paracites in the organs or structures of the body, or anywhere, except in the blood during the actual presence of the fever. They disappear quickly after the commencement of the intermission, re-appear in the relapse, and again quickly disappear with the final defervescence. All efforts to cultivate or propagate them have failed, yet Lebert confidently represents them as the essential cause of the fever.* Such a conclusion, however, is premature, as there are no positive facts indicating whether they act as a cause or are merely an accompaniment of the general fever. On the contrary, if the spirillum discovered by Obermeier is identical with the spirochæte of Ehrenburg and Cohn, it is by no means peculiar to the blood of relapsing fever patients, and it will require a much more extensive and varied series of observations than have yet been made, to afford a sufficient number and variety of facts to justify the announcement of positive conclusions concerning the protomycetic origin of this variety of the fever. The disease, during an epidemic, attacks persons at all periods of life, but in larger proportion children under fifteen years, and adults between twenty and thirty years of age. Neither sex nor season of the year appear to exert any influence over the prevalence of the disease. The poor, destitute and overcrowded portions of the population furnish most of the victims in every epidemic. So true is this, that in Ireland it is frequently called *famine* fever. The period of incubation is supposed to vary from three to nine days. One attack does not permanently destroy the susceptibility of the individual to one or more subsequent attacks.

Symptoms.—An attack of relapsing fever commences abruptly with a well marked chill or cold stage, which is generally of short duration, and is followed immediately by active febrile excitement. The skin becomes hot, the face flushed, the tongue covered with a thin, white fur, the pulse frequent and compressible, usually from 100 to 110 per minute, but sometimes reaching 130 before the end of the first twenty-four hours ; respirations accelerated in frequency, and temperature in the axilla from 39° C. (102 .5° F.) to 40° C. (104. 2° F.) ; very severe pains in the head, back and limbs, more especially in the muscles and joints of the extremities ; there is also much nausea and distress in the epigastrium, with frequent vomiting of matter tinged with the coloring matter of bile, and sometimes diarrhœa, but more frequently moderate constipation. The quantity of urine is much diminished, redder than natural, sometimes, though rarely contains albumen, and still more rarely blood-corpuscles and hyaline casts. The active general febrile excitement thus established, usually continues with but little change in the assemblage of symptoms, from five to seven days, when it declines as rapidly as it was developed. During the whole of this period the patients are very restless, getting but short intervals of sleep, suffering severely from pains in the parts already mentioned, having occasionally epistaxis, and temporary sweating, but very rarely either delirium or stupor. The decline of the fever is generally marked by a copious perspiration, during which the temperature returns nearly or quite to the natural standard, and the patient presents all the ordinary appearances of real convalescence. This state of apyrexia or intermission, usually continues from three to seven days, when the patient is again attacked abruptly by a chill or chilliness, speedily followed by fever similar in all respects to the first attack, except in being a little less severe. It also continues about the same length of time, namely, from five to seven days, and again terminates abruptly in a copious sweating.

* See Cyclopædia of the Practice of Medicine by Ziemssen, Vol. I, page 263.

Sometimes, though rarely, the crisis is marked by a temporary diarrhœa, or diuresis instead of perspiration. The decline of the second febrile period is generally followed by permanent convalescence, but not always. In a very small proportion of the cases, after five or six days of intermission, a third period of fever supervenes, presenting the same characteristics as the second, and terminating in the same manner. Even a third relapse or fourth period of pyrexia has been noticed by some practitioners; and, on the other hand, a few cases have been observed which presented but a single febrile period of from five to seven days' duration, followed by permanent convalescence. You perceive by this description that the ordinary course of the disease, consisting of two active periods of fever, separated by a few days of intermission, usually occupies from two to three weeks, while the extremes may vary from a single febrile period of three or four days, to four pyretic periods, which, with the intervening intermissions, may extend the sickness to six or seven weeks. The convalescence in all cases is attended by considerable muscular weakness and some degree of impoverishment of the blood, but it is seldom followed by any important sequelæ. A severe form of ophthalmia has been observed as a sequel of the fever in a limited number of cases.* In some of the more severe epidemics, many of the patients showed a moderate yellowness of the skin, which gave rise to the name of "mild yellow fever."

In the few instances in which the disease has terminated fatally, the gastric symptoms have been unusually severe, the matter vomited presenting a dark *coffee ground* color, the secretion of urine being nearly or quite suppressed; and in some instances petechial spots on the skin, and in others the nervous disturbances of uremic poisoning have preceded the final collapse. In some cases of only average severity, the sudden termination of the febrile period in the intermission or the convalescence has caused the pulse to diminish in frequency, in four or five hours, from 130 per minute to 54; and the temperature from 40.5° C. (105° F.) to 35° C. (95° F.).

The depression below the natural standard of pulse and temperature in such cases proved to be of brief duration, and was attended by no bad results.

Diagnosis.—The symptoms more specially characteristic of this variety of fever, are the abruptness of its beginning; the rapid rise of temperature, the severity of the gastric symptoms; the violence of the pains in the muscles and joints; the sudden decline accompanied by copious sweating, and the equally sudden relapse after several days of complete intermission. Negatively, it is distinguished from the epidemic influenza, by the absence of catarrhal symptoms; from the dengue by the absence of the scarlet eruption and the remission of fever during the third and fourth days; and from typhoid and typhus by the absence of a prodromic or forming stage, and the dull expression of countenance, and later, the absence of either rose spots or maculæ on the skin, and the entire absence of gurgling, abdominal tympanites, and muttering delirium.

Prognosis.—Considering the severity of the symptoms, and their duration, the prognosis is unusually favorable in this disease. In the majority of seasons when it has prevailed, the ratio of mortality has not exceeded two per cent. of the number attacked. Of one hundred and three cases admitted into the Bellevue Hospital in the winter of 1869–70, only two died. One of these died suddenly on the seventh day, supposed to be from syncope. The other died from uremic convulsions and coma, produced

* See Transactions of American Medical Association, Vol. I, p. 373.—1847.

by suppression of urine.* In some unsually severe epidemics the ratio of mortality has reached ten per cent. In most instances the fatal termination has resulted from the supervention of local complications, such as pneumonia, acute nephritis, meningitis, etc. Lebert informs us that in an epidemic at Breslau, pneumonia was the principal complication, while during a severe prevalence of the disease in St. Petersburg, the principal dangerous complication was a hæmorrhagic pachymeningitis. Fatty degeneration of the heart has been assigned as the cause of death in some cases.

During the prevalence of the disease in Philadelphia in 1870, it attacked a considerable number of the colored population, and proved fatal in a much larger proportion of the cases than among the whites. When it attacks pregnant women it very generally induces an abortion or premature labor. The fœtus is usually born dead, but the mother recovers.

Special Pathology.—It is evident from a careful study of the symptoms presented by this disease, and the results as found on *post mortem* examinations, that the primary change in the properties of the tissues is neither one of simple exaltation or excitement, as in the febriculæ, nor of direct depression, as in the typhoid and typhus ; but rather one of specific character, consisting of an increase of the susceptibility, coupled with a moderate impairment of the vital affinity. The action of the special cause or causes of the disease in the directions just named, produces decided impairment of the molecular changes constituting nutrition, disintegration and secretion, accompanied by active disturbance of nervous sensibility. The latter is indicated by the severe pains felt by the patients in the head, back, and extremities, coupled with much restlessness, and functional disturbance of the stomach, instead of the dullness and indifference that characterizes the typhoid and typhus. The comparatively uniform and limited duration of the febrile symptoms, ending abruptly in critical evacuations, show the nature of the morbid impressions and actions to be decidedly that of irritation, with but little tendency to structural changes in any of the tissues, or to serious impairment of the constituents of the blood.

Pathological Anatomy.—There are no pathological changes of structure specially characteristic of relapsing fever. Careful, microscopic examinations have discovered the same tendency to granular, fatty degeneration in nearly all the important organs and structures, as is found after death from typhoid fever. Slight hæmorrhagic exudations or infractions have been found in the brain, liver, spleen, and kidneys. The spleen is generally much enlarged, dark colored, and softened, being filled up with lymphoid elements, in which are large granular cells containing fat, and sometimes red blood corpuscles. More rarely, points of suppuration have been seen. The liver and kidneys are also generally enlarged and their texture changed in the same direction as that of the spleen, but less in degree. In a majority of cases examined, the muscular structure of the heart, and the striated muscular structures in other parts of the body, were found in various stages of fatty degeneration. In a small proportion of the cases *ecchymoses* were seen in the mucous membrane of the stomach, the pleura and pericardium, and petechial spots on the skin. A limited amount of inflammation has generally been found in the mucous membrane of the ilium and colon, with enlargement of some of the solitary glands. The only differences between the changes I have now described and those in typhoid fever, consist in traces of more active inflammatory

* See Principles and Practice of Medicine, by Austin Flint, M. D. etc. Fifth Edi. p. 990.

action in the kidneys and spleen, and a greater number of points of hæmorrhagic exudation in other parts. This is explained in part by the fact that in relapsing fever the susceptibility of the tissues is less impaired, and in part by the further fact that the disease seldom terminates fatally except by the supervention of some local inflammatory complication, such as nephritis, pneumonia, meningitis, etc. Dr. Lebert states that while the disease was prevailing in Breslau, numerous *post mortem* examinations were made, and though diligently searched for, no traces of the *Spirillum Obermeieri* were found in any of the structures of the body. The blood was uniformly found dark in color, and either fluid or less coagulable than natural. The microscope showed an increase in the proportion of white corpuscles, a greater number of minute granular bodies, and occasionally a large fatty cell; none of which, however, are peculiar to the blood in this disease.

Treatment.—The indications for treatment are, first, to suspend as far as possible the further influence of both predisposing and exciting causes; second, to relieve the suffering of the patient by palliating the more distressing symptoms; third, to prevent the development of important local complications; and fourth, to sustain the strength and general nutritive processes until convalescence is well established. The predisposing causes are best removed by securing for the patient fresh air, cleanliness, rest, and suitable nourishment. If there is a specific exciting cause acting through the blood upon the properties and functions of the system, whether it consist of the Spirilli of Obermeier, the Spirochæte of Ehrenberg and Cohn, or some other infectious material, it would afford a rational indication for the early and persistent use of some antiseptic or parasiticide. Keeping in mind the second indication I have mentioned, namely, to lessen the severity of the patient's suffering, which is chiefly from the intense pains in the head, back, and extremities, with epigastric distress and vomiting, we should select such antiseptics as will aid most in alleviating these symptoms at the same time that they tend to destroy the specific infection in the blood. For accomplishing both these purposes there are probably none more efficient than the carbolic and salicylic acids.

The first of these I used in combination with gelsemium and camphorated tincture of opium, in the treatment of the few cases that came under my care in 1870, and found it quite efficient in arresting the vomiting and lessening the pains and restlessness. From the known efficacy of salicylic acid in relieving the intense pains of acute rheumatic fever and its efficiency as a parasiticide, I should expect great benefit from its prompt use in the early stage of the relapsing fever, if the stomach would retain it. During the prevalence of the disease in Berlin in 1878–79, Dr. Riess reports having used the salicylate of sodium, with excellent results. In the early stage of the disease the salicylate of sodium should be given in 0.66 gram (gr. x.) doses dissolved in water, and repeated every two or three hours until the severe pains and restlessness abate, after which it may be continued at longer intervals until the intermission supervenes, unless as the crisis approaches between the fifth and seventh days, the pulse becomes weak and slow, the face pale, with a sense of weakness or weariness. Should these symptoms supervene, the salicylate should be omitted, and in its place 0.13 grams (gr. ii.) of quinine may be given every four hours, and alternating with it a powder containing 0.33 grams (gr. v.) of Dover's powder with 0.13 grams (gr. ii.) of pulverized gum camphor. If, at the beginning, the nausea and vomiting is sufficient to interfere with the retention of the salicylate of sodium,

they may be first allayed by giving during the first twelve to twenty-four hours the carbolic acid combined as in the following formula:

℞	Acidi Carbolici,	0.5 grams	gr. viii.
	Glycerinæ,	15.0 c. c.	ʒiv.
	Tincturæ Gelsemii,	15.0 "	ʒiv.
	Tincturæ Opii Camphoratæ,	60.0 "	℥ii.
	Aquæ,	60.0 "	℥ii.

Mix, and give 4 cubic centimeters (fl. ʒi.), or an ordinary teaspoonful every two or three hours, until the vomiting ceases. This may be aided by the application of cloths wet in cold water to the head, and mustard sinapisms to the dorsal part of the spine and to the epigastrium. Whenever the skin is hot and dry, frequent sponging of the surface with cool water, will be both grateful to the patient and efficiently antipyretic. To prevent local complications, daily attention should be given to the quantity and quality of the urine, and if it becomes very scanty, either with or without the presence of albumen, digitalis may be given in connection with the acetate of potassium. If diarrhœa or dysentery supervene, they should be checked by the same remedies that I recommended for restraining excessive intestinal evacuations in typhoid fever. As soon as the intermission supervenes, the patient should have as much nutritious food as will be readily digested ; avoid all fatiguing exercise and take from 0.66 to 1.00, grams (gr. x. to xv.) of the sulphite or hyposulphite of sodium dissolved in mint water, before each regular meal-time, and at bed-time, and a pill containing citrate of iron and quinine, each 0.13 grams (gr. ii.), after each meal-time. By the action of the salicylate of sodium during the febrile stage, and the sulphite during the intermission, I should expect the relapse to be entirely prevented, or its severity greatly lessened. If, at the usual time, however, the febrile stage returns, it must be treated on the same principles and by the same means, as in the first stage, though it is not generally necessary to pursue the treatment as actively as at first. The same vigilance must be exercised in regard to the checking of local complications, and more care must be taken to see that the patient is supplied with proper nourishment. When convalescence finally comes, the patient should continue to take small doses of quinine and iron, plain but nutritious food, and be very cautious about taking much exercise either of body or mind, until the strength is well restored. There are no sequelæ peculiar to relapsing fever.

Prophylaxis.—The best means for preventing the spread of the disease, are, to isolate the sick as far as practicable, efficiently enforce wholesome sanitary measures, and secure for the masses of the people a proper supply of good food.

LECTURE XVII.

Yellow Fever—Its History, Causes, Symptoms, Diagnosis, Prognosis, Pathological Anatomy, Special Pathology, and Treatment, Prophylaxis.

GENTLEMEN:—I now invite your attention to a disease, which, from its frequent recurrence in epidemic form, the high ratio of mortality resulting from it, and its serious interference with important commercial interests, has attracted much attention in this country, not only from physicians but from sanitarians and the public generally. I refer to Yellow Fever, or Typhus Icterodes of the ancients. As the home of the plague was formerly traced to Egypt and the countries bordering on the eastern part of the Mediterranean Sea, typhus and relapsing fever to the British Islands and the countries bordering on the Baltic, so the yellow fever is traced still more definitely to a home or permanent habitat in the Antilles or West Indian, and other islands in the tropical part of the Atlantic Ocean and Gulf of Mexico, and the northwestern part of the coast of Africa. Within the limits just named it prevails to some extent every year; sometimes very mildly and in other seasons with great severity. At irregular periods, varying from three to ten years, it breaks over these apparently natural boundaries, and appears epidemically in the principal cities and seaport towns bordering on the Gulf of Mexico, in the south and southeastern part of this country, in the northeastern portion of South America, as far south as Montevideo and Buenos Ayres, and along the northwestern coast of Africa, and the southwestern coast of Europe, to the borders of Spain, Portugal and France. In our country, it has at times extended inland, chiefly along the rivers and lines of commerce, as far northward as the Ohio River, and along the Atlantic coast northward to Norfolk and Portsmouth in Virginia, and very rarely to Philadelphia and New York. Within the tropical part of the Atlantic Ocean it often makes its appearance on shipboard as well as on land. It has not been known to prevail to any extent on any of the islands in, or coasts bordering on, the Pacific Ocean. You perceive that the home of the disease is in warm climates, but why it should habitually prevail on the islands, ships and seaport towns in the tropical part of the Atlantic, and not in corresponding parts of the Pacific Ocean, is not easy to explain. When the disease extends beyond its ordinary boundaries in an epidemic form, it is always during the warm season of the year.

Dr. H. Hartshorne states that the first appearance of yellow fever in any part of our country, of which we have any record, was at New York in 1668; its first appearance in Philadelphia, was in 1695; in Mobile in 1705; and in New Orleans in 1769. Since the last date mentioned, the most severe epidemics have been in 1819, '47, '53, '54, '55, '58, '67, and '78. From 1695 to 1822, the disease several times prevailed severely in New York and Philadelphia, but since the latter date it has not prevailed sufficiently to merit the name of an epidemic north of Portsmouth and Norfolk on the Atlantic coast, and not north of the line of the Ohio river, and St. Louis in the interior, or valley of the Mississippi. It prevailed to a very limited extent on a part of the coast of Staten Island, at the entrance of New York harbor, in the summer of 1847. Perhaps the most extensive epidemic of the disease that has ever occurred in this country, was that of 1878.

Causes of Yellow Fever.—The circumstances that favor the prevalence of yellow fever are: a protracted high temperature, giving a mean above 22° C. (72° F.); proximity to the waters of the Atlantic ocean, or the gulfs, rivers, and bays communicating with it, between the parallels of latitude of 45° north and 35° south; and low altitudes, or such as approximate to the level of the ocean. In regard to the first of these favoring circumstances, or predisposing causes, it is necessary to remind you that it is not the mere high temperature of one or two days, but of several weeks, that appears to be necessary as one of the conditions under which the disease may become epidemic. Hence it seldom commences to attract public attention in New Orleans, and other places bordering on the Gulf of Mexico, until a little past the climax of summer heat; or, in other words, not until the last half of July, and sometimes not until in August. When it has fairly commenced, it generally continues until so far in Autumn that the atmospheric temperature falls below the freezing point, after which new cases become infrequent, and the disease soon disappears from the community. Isolated or sporadic cases may occur earlier in the season; or cases may be introduced from on board ships from some of the West India Islands, but there has been no development into an epidemic prevalence until the summer temperature has been well advanced. Previous to the epidemics of 1867 and 1878, '79, the disease had never manifested much tendency to extend into the interior, remote from the sea coast, except along rivers and water courses occupied by commerce, and opening into the sea within the yellow fever zone. But in these two later epidemics, it extended over a large part of the interior of the states bordering on the Gulf, and northward through Tennessee and parts of Kentucky and Missouri. In regard to the influence of elevation, I think the highest point on which the disease has prevailed in this country, was at Gallipolis, a little more than 600 feet above the ocean. But within the tropics the disease has been reported at New Castle, Jamaica, at an elevation of 4,000 feet, and in some parts of Mexico at 3,243.*

During the last few years, Dr. W. Huston Ford, of St. Louis, has published the results of observations concerning the relations of temperature to the prevalence of yellow fever. He has been enabled to compare the meteorological and mortuary records of Charleston, South Carolina, through a period of thirty-eight years, and of ten other southern cities for a period of five years. Of the thirty-eight years included in the records in Charleston, seventeen were characterized by more or less prevalence of yellow fever. In six of these seventeen years the disease assumed a severe epidemic form; in six, mildly epidemic, and in five, only a few sporadic cases occurred. Only twice during the whole period did the disease prevail in decided or severe epidemic form two years in succession. In nearly all instances only sporadic or scattering cases occurred the summer succeeding a severe epidemic. The commencement of the disease was generally in August, and its prevalence was limited to the months of August, September and October. On comparing the meteorological with the mortuary records for the whole period of thirty-eight years, Dr. Ford found that the years in which the yellow fever was epidemic were the same in which the summer heat rose to the highest *mean* for the three months just named in each year. The six years of severe epidemic prevalence were also the six years giving the maximum mean temperature of the summer months. The six years of slight epidemics ranked next in the mean temperature of the same months.

* See A System of Medicine, by J. Russell Reynolds, M. D., etc. Vol. 1, p. 284, Amr. Edition, 1879.

The five years of sporadic cases gave a mean temperature for summer and autumn less than those in which the disease was moderately epidemic. In the remaining twenty years in which there was no prevalence of the yellow fever, the mean temperature of the summer months was at the minimum; the highest of any of these years being lower than the lowest of those in which the disease prevailed. The only exception to this rule was in 1836, when the mean temperature of the months of July, August, September and October, was as high as the years of most severe epidemic prevalence of yellow fever, and in that year the city was scourged by a severe epidemic of cholera, that appeared to supercede the yellow fever. Dr. Ford has analysed and compared these statistics of Charleston in the most varied and philosophical manner, but always arriving at the same result, namely, that the seasons of yellow fever epidemics are identical with those of highest summer temperature. His comparison of meteorological and mortuary statistics in the other ten cities situated on the Gulf of Mexico and along the Mississippi River, as far north as St. Louis and Louisville, is only for a period of five years, including 1874–5–6–7–8. But they lead to precisely the same conclusions.

Thus the summers of 1873–4, were a little above the average mean for a series of ten years, and there were moderate epidemics of yellow fever in several of the cities on the lower Mississippi and the Gulf. The summers of 1875–6–7, were decidedly below the mean temperature for a series of ten consecutive years, and there were no epidemics of the fever in any of the cities under consideration. The mean temperature for July, August, September and October, was the lowest in 1875, from which an annual increase was presented in 1876 and 1877, culminating in the extraordinary summer temperature of 1878, and the equally extraordinary epidemic prevalence of the disease. The mean temperature of the summer of 1879, falls below that of 1878, yet is decidedly above the average for a series of years, especially in the middle and lower part of the Mississippi valley. And true to the law already deduced, the yellow fever re-appeared fairly epidemic in Memphis and its vicinity, and sporadically in New Orleans and a few other places. These eminently philosophical deductions of Dr. Ford, are corroborated by a great variety of other facts; and are sufficient to show a *necessary* connection between unusual high summer temperature and the appearance of yellow fever epidemics. If the investigations related only to the years 1878 and 1879, or to any other one or two years, the co-existence of a high, mean summer temperature and an epidemic prevalence of the fever, might be regarded as merely accidental; but when the statistics cover a period of thirty or forty consecutive years, as in the case of Charleston, and the same co-existence is found uniform throughout, the presumption of accidental coincidence ceases, and the deduction assumes the importance of a fixed law. The same series of investigations and statistical comparisons also establish the important fact, that the fever never assumes an epidemic character until the high summer temperature has progressed two months, namely, through the months of June and July; the favorite month for its epidemic ravages to commence in our country, being August. And in the few instances of its commencing to prevail epidemically in July, it is found that the high summer heat had commenced in May. Such was the case in Memphis, in the summer of 1879. In the temperate zone the sun reaches a position relative to the earth, which gives to its rays most directness and power to impart the greatest amount of heat to the earth's surface, about the 21st of June. At the same time, the days become the longest compared with the nights, and consequently, more heat is absorbed each day by the earth than is radi-

ated into the air during the night; and hence there is a steadily increasing temperature of the earth's surface through June, July and August, while that of the atmosphere may be much more fluctuating. Oftentimes, even here in Chicago, the mercury rises higher for a few hours in the middle of some days during the third week in June, than in any other days of the year, but the nights are yet cool, and no visible disturbances of health result from such temporary high temperature. So also many instances have occurred where ships having yellow fever on board, have arrived in New Orleans and other Gulf or Atlantic ports, during the months of May and June, and even here and there a sporadic case has occurred in those cities, independent of any known importation, during those months; yet no general or epidemic development has appeared, until the latter part of July or in August, and in many instances, not until early in September. These facts show that it is not merely high temperature, but such temperature continued until the surface of the earth reaches a degree of heat and moisture most favorable for rapid decomposition of organic matter, and the suspension of the products of such decomposition, with aqueous vapor in the atmosphere, that we get the exact meteorological condition *necessary* for originating or sustaining an epidemic of yellow fever. But even when the temperature is sufficiently high and long continued, with a moisture most favorable for fermentation or decomposition of organic matter, yet no epidemic yellow fever will be developed, unless the particular kind of organic matter required be present to undergo such change, in sufficient quantity to impregnate the atmosphere to a considerable extent. Just what the deleterious material is that is engendered and diffused in the atmosphere as the pabulum for supporting yellow fever, is not yet known. Neither is it fully known what kind of fermentative or decomposible organic matter is necessary to furnish the pabulum on which the heat and moisture are to act. Yet all the facts connected with the origin and progress of the yellow fever during the years 1878–9 point unmistakably to local atmospheric and topographical conditions as exerting a controlling influence over the spread or continuance of the disease, whether its supposed essential cause was imported or not. For instance, in the summer of 1878, the disease assumed an epidemic form in New Orleans during the month of July, and prevailed nearly a month before any cases were recognized in Memphis, although there was constant communication between the two cities, both by river and railroad. And at a still later period the disease made its appearance in many smaller places, more or less distant from each other, so nearly simultaneous as to preclude the possibility that it had been communicated from one to another.

Again, in the year 1879, as is well known, the disease commenced in Memphis, and prevailed severely before it had appeared in New Orleans, or any other place bordering on the Gulf. More than half the population speedily abandoned the city, scattering themselves widely over the more northern parts of the country; many hundred more went into camps on well chosen ground only twenty or thirty miles distant from the city; while the local board of health, aided by the State and national health organizations, not only established and enforced the most rigid quarantine, but waged an unceasing warfare upon the disease in the city by isolation and disinfection, using almost unlimited quantities of the best antiseptic and disinfecting remedies known; and yet the epidemic continued the even tenor of its way in the city, and after five weeks made its appearance in a score or more of smaller places in different directions from Memphis. But the moment a severe frost made its appearance, reducing the temperature of the atmosphere a little below 0° C., or 32° F., the disease, which

for nearly three months had bid defiance to hundreds of tons of disinfectants and any number of quarantines, even when aided by shot-guns, disappeared as if by magic. If we put the facts recently developed in regard to the necessary influence of continuous high temperature in originating an epidemic of yellow fever, with the long known fact that a *low* temperature invariably extinguishes it, we have proof amounting to demonstration that the propositions already stated in relation to the several conditions that *must co-exist* in any given locality to allow the development of an epidemic of this disease, are correct.

Without entering further into details in reference to the etiology of yellow fever, I will simply state that the contagium vivum theory, which assumes the essential cause of the disease to be an organic germ, capable of self propagation, and without the introduction of which from some prior case, no combination of circumstances can produce the disease, is purely hypothetical and unsupported by any basis of ascertained facts. No organic germs peculiar to this disease have been found either in the blood, secretions, or tissues of yellow fever patients, though diligently sought for by many of the most competent microscopic investigators, both in this country and Europe.*

The well known fact that sporadic cases of yellow fever occur in the West Indies and in New Orleans almost every summer, and that cases are brought on ships to more northern parts often, without causing any spread of the disease, show that if there is a fever *germ*, it certainly requires some peculiar local condition of the atmosphere for its propagation. Another fact still more difficult to explain on the germ theory, is, that the disease very rarely prevails, as an epidemic, more than one or two years in succession in the same place. The same general series of facts bear still stronger against the doctrine of personal contagion. For a full and interesting discussion of the whole subject of the etiology of yellow fever, however, I must refer you to the very complete work of Dr. R. LaRoche, of Philadelphia, in two full sized octavo volumes, published in 1855. They constitute the most complete treatise on this disease in our language. Before leaving this part of our subject, it is proper to remind you that many of those who have had ample opportunities for the personal study of yellow fever, and who have been eminently qualified to judge correctly, have regarded it as simply a modified form of the ordinary endemic malarious fever of the southern States. Thus Dr. Benj. Rush regarded the disease as it prevailed in Philadelphia during his day, as "nothing but a high grade of bilious fever;" and Dr. E. D. Fenner, of New Orleans, who investigated with great care the origin and progress of no less than twelve epidemics in that city, says: "Our position is, that yellow fever is only one of the forms of *endemic* fever (malarious, if you will), which derives its characteristic features from the *locality* and attendant circumstances where it prevails."†

Persons who have suffered from one attack of the fever, rarely become susceptible to subsequent attacks, although there are many exceptions to this rule. It attacks persons at all periods of life, yet the highest ratio both in numbers attacked and in fatality, is during the period of vigorous adult life, between 20 and 40 years of age. Sex appears to exert but

* See Pathology and Treatment of yellow fever, with some remarks on the nature of its cause and its prevention, by H. D. Schmidt, M. D., of New Orleans, La., in the Chicago Medical Journal and Examiner for October, 1881, p. 364.

The Microphytes which have been found in the blood and their relations to disease, by Timothy Richard Lewis, M. D., etc., in the Quarterly Journal of Microscopical Science, for July, 1879.

The Microscopic Germ-Theory of Disease, by H. Charlton Bastian, M. D., in Monthly Microscopical Journal, August, 1875.

† See Transactions of the American Medical Association, Vol. VII, p. 536, 1854. Report on Epidemics of Louisiana.

little influence. The colored population have generally suffered much less during yellow fever epidemics than the white. Long residence or full acclimation has a very marked effect in diminishing the susceptibility to the disease, while but few of those who have recently come within the yellow fever zone, escape an attack during the prevalence of an epidemic.

Symptoms.—The symptoms of yellow fever vary very much in their severity, in different cases and in different epidemics. There is generally a forming or prodromic stage of from one to three days duration, characterized by a sense of weakness or indisposition to mental or physical activity; some aching in the head, back, and limbs; with alternate feelings of heat and cold. These are followed by a more distinct chill, though of short duration, and active febrile reaction, giving to the face a deep suffused redness; a red and watery appearance of the eyes; a hot and dry skin, the temperature rising rapidly to 39° or 40° C. (102.5° or 104.2° F.) and sometimes to 43° C. (110° F.); pulse from 90 to 100 per minute, and moderately full; tongue covered with a white or yellowish white fur, and moist; severe pains in the frontal region of the head and lumbar part of the spine, with general restlessness; much distress and tenderness in the epigastrium; considerable thirst, and in many cases frequent and severe vomiting, with more or less constipation of the bowels. The urine is scanty and high colored; and though the mind is generally clear, in many of the more severe cases, delirium is an early and prominent symptom. The group of active pyretic symptoms I have now enumerated, are all well developed if not at their climax before the end of the first twenty-four hours after the initial chill, and they continue with but little change in their character from two to five days, when they begin rapidly to decline, and in a few hours the patient is in a state of apyrexia, and so quiet and comfortable as to present almost all the features of an actual convalesence. And in the mildest class of cases there is no renewal of unpleasant symptoms, and the convalesence is complete. In far the greater number of cases however, this intermission or "period of calm" is only transient, lasting from six to twenty-four hours, when febrile symptoms return, in some cases in a much less active form than during the first paroxysm, and after a mild course of from one to two weeks, ending in recovery; and in many others in a form so severe as to prove speedily fatal.

It is generally during the intermission, and the subsequent renewal of febrile symptoms, that the skin begins to present the peculiar yellow hue which has given the name to the disease. In all the more severe cases the intermission is speedily followed by a soft, compressible, or gaseous pulse, either very frequent or preternaturally slow, sometimes falling to 40 per minute, or even slower; the skin cool; the mind dull, wandering and incoherent; the urine very scanty and albuminous, or suppressed; and frequent vomiting, sometimes of a thin, white, and sour fluid, but much more frequently the matter vomited is thin, copious, and dark-brown, from the presence of flakes of a black coffee-ground appearance, consisting of altered blood corpuscles, and sometimes it is real, unaltered blood. In bad cases the skin becomes hourly more yellow; the eyes retaining their redness, gives a peculiarity of expression highly characteristic of this disease; the pulse becomes weaker and more irregular; the vomiting more copious, being more like regurgitation than ordinary vomiting; the discharges from the bowels dark-brown, sometimes thick and black, like tar, and at other times much like the dark coffee-ground material ejected by vomiting; blood not unfrequently oozes from the nose, gums, ears, fingers, kindeys, uterus, and into the skin, causing petæchial spots or vibices, especially over the posterior part of the trunk of the body

and extremities; complete collapse and death soon follows. Sometimes the death is preceded by entire suppression of urine, convulsions and coma, and in other cases the mind remains clear or free from derangement until the end. The entire group of symptoms I have thus stated as following the brief period of calm on the subsidence of the first run of active fever, may develop so rapidly as to cause death in the first twenty-four hours, or this result may not be reached until the end of the fourth or fifth day. And in a few instances, even after well-marked black vomit, recoveries have taken place. In cases of less severity than those I have just described, the calm or remission is followed by the re-establishment of fever, more resembling the typhoid in its grade and general features, which may continue from one to two weeks, and generally ends in convalescence. During the more severe epidemics, a few cases are usually met with in which the attack is sudden, and the morbid actions established in the blood and tissues so intense, that life is destroyed in from twenty-four to forty-eight hours. On the other hand, in the absence of special epidemic influence, the disease as it prevails endemically in the West Indies and sporadically in New Orleans, often runs a very mild course of from five to seven days, and ends in permanent convalescence. During seasons of epidemic prevalence, however, nearly all the cases present a well-marked active febrile paroxysm, continuing from three to seven days, a brief period of calm or intermission, and a renewal of febrile symptoms of greater or less severity, which may continue from a single day to two weeks. Most writers describe this order of phenomena as three stages of the disease; the first, a protracted paroxysm of active fever; the second, a brief stage of apyrexia or intermission; and the third, a period of secondary fever. Dr. Austin Flint and some others, prefer to regard the disease as consisting in a single protracted paroxysm of fever, and the periods of intermission and secondary fever as sequelæ.

Diagnosis.—The chief diagnostic symptoms in the early stage, are suddenness of access, unusual redness of the eyes, severity of pains in the head, back and limbs, epigastric tenderness, and in many cases, active vomiting. The continuance of these symptoms from three to five days, ending rather suddenly in an intermission, accompanied by the development of yellowness of the skin, and such intermission followed in a few hours, by a renewal of fever with increased yellowness, with or without the vomiting of dark coffee-ground material, renders the diagnosis reasonably certain. If to these symptoms are added, hemorrhages from the bowels, nose, mouth, and petechiæ, or hemorrhagic spots on the surface, with scanty and albuminous urine, the diagnosis is complete. You will see by these statements, that when a well-marked case of yellow fever is attended through its successive stages to the end, there is no difficulty in distinguishing it from all other febrile affections.

But in the very mild cases that terminate in convalescence, at the end of the first febrile stage, there are no symptoms so distinctive or specially characteristic, as to enable the practitioner to differentiate them with certainty, from cases of febricula on the one hand, or of mild remittents on the other. And in the early stage of cases of ordinary severity, there are no symptons except such as may be occasionally seen in the early exacerbations of intermittent and remittent fevers. So true is this, that the most intelligent and experienced physicians in those southern cities most subject to the prevalence of yellow fever, differ in opinion about the diagnosis of the first few cases that occur at the commencement of every epidemic.*

*The late Dr. E. D. Fenner, of New Orleans, writes in regard to this subject, as follows: "The general impression derived from reading descriptions of yellow fever is, that it is a violent fever

Dr. Aitken and some other eminent English writers, endeavor to make a distinction between the "*true* yellow fever," which they claim to be specific and propagated by personal contagion, and "a malarious form of yellow fever," which is allied to the ordinary periodical fevers. They acknowledge that yellowness of the skin, black vomit and other hemorrhages occur in both, and that the only reliable distinction is the communicability of the true or specific disease, from person to person, and its occurrence in the same individual but once.*

Judged by these tests, most of the important epidemics that have appeared in this country, would have to be classed as false or malarious yellow fever. I think the distinction is not sustained by a sufficient number of accurately observed facts, and cannot be maintained at the bedside of the sick.

Prognosis.—The yellow fever as it occurs endemically within the proper yellow fever zone, is often a mild, febrile disease and attended by a very small ratio of mortality. In its epidemic form, however, it is always attended by a high ratio of deaths; and yet the fatality accompanying one epidemic has differed much from that of others; and the same epidemic has proved much more severe in some localities than in others, and generally more fatal at the beginning and during increase, than during its decline. Dr. LaRoche estimates the average mortality of the disease in its epidemic form to be 1 in 2.32. The highest ratio that I have seen reported was 75 per centum. You must remember, however, that the fatality as stated by Dr. LaRoche and most other writers, is based mostly upon official reports from hospitals, boards of health, etc., and do not correctly indicate the ratio of mortality in the private practice of intelligent and efficient physicians. For instance, in the severe epidemic which prevailed in New Orleans in the summer of 1853, there were reported from official sources 15,263 cases, of which 5,054 proved fatal, being 33.11 per centum; while Dr. Fenner tells us that of 127 cases occurring in his private practice during the same epidemic, only 7.87 per centum died, or a little more than 1 in 13.

A part of this difference is attributable to the fact, that the cases treated in their own homes by their regular family physician, are generally seen earlier and the whole treatment conducted under more favorable circumstances, than those taken to hospitals or placed in charge of official organizations.

The symptoms that are regarded as pointing more directly towards a fatal result are, the black vomit and other severe hemorrhages, suppressed or scanty and highly albuminous urine, convulsions, and coma. The two last indicate the presence of uremic poisoning. Most writers represent the black vomit alone as a certain forerunner of death. But such is not always the case, although it is an exceedingly unfavorable symptom. In the epidemic of 1853 in New Orleans, according to Dr. Fenner's report,

of a single paroxysm, lasting about seventy two hours, and presenting strongly marked *characteristic* symptoms, by which it may readily be distinguished from all other types of fever. I have not found it so; nor have I yet found the man who could always say correctly whether a case, examined *per se*, was yellow fever or not. I have already shown what differences of opinion were expressed about the first cases that appeared this year (1853), and have only to add that the same thing occurs here every year. The truth is, yellow fever is so closely allied to remittent and intermittent fever, that no uniform and reliable distinction can be drawn between them in the early stages, and the only way we get at the fact that yellow fever is prevailing, is by observing the *final results*, whether in death or convalescence; and the former is by far the most conclusive of the two. Even in such an epidemic as this, thousands of cases occurred which no one would have thought of calling yellow fever, if it had not been generally known that many of the same character and appearance had terminated in fatal black vomit."—See report on the Epidemics of Louisiana, etc., for 1853, by E. D. Fenner, M. D., in the transactions of the American Medical Association, Vol. 7, 1854, p. 466.

*See the Science and Practice of Medicine, by Wm. Aitken, M. D., etc., Third Amer. Edition, pp. 565-6.

to which I have already several times alluded, about seven per centum of the well marked cases of black vomit recovered. And he enumerates no less than thirty-eight similar cases of recovery in the private practice of six or seven well known practitioners in that city. The prognosis in all cases of yellow fever must be given with caution, as there is no other general acute disease so deceptive, or subject to such sudden and unexpected changes of an unfavorable character.

The intemperate, or those who use freely alcoholic liquors, give a very high ratio of mortality when attacked with this disease.*

Pathological Anatomy.—The peculiar yellow color presented by the skin in most fatal cases, is also seen on making post mortem examinations, staining all the membranous structures in some degree. Slight serous effusions have been found in some cases in the membranes of the brain, the pericardium and pleura, and more or less hypostatic congestion of portions of the lungs. But no pathological or structural changes, peculiar to yellow fever, have been found in the contents of the cranium or chest. In the abdomen the chief morbid changes are found in the liver, stomach, duodenum, and kidneys. The liver is not much enlarged, but is altered in color and texture. It presents a light yellow or fawn color, in some cases throughout the whole organ, and in others it is limited to particular parts.

This change of color which differs much in degree in different cases, appears to depend on an infiltration of fatty matter and oil globules, with some degree of true fatty degeneration of the hepatic cells. This was first demonstrated by Dr. Alonzo Clark, of New York, in 1853, and has been confirmed by many other observers since. Dr. Schmidt, of New Orleans, from his numerous examinations during the epidemics of 1867 and 1878, not only recognized the marked accumulation of the fatty matter, but also pointed out the staining of the hepatic cells with hæmoglobin from impaired blood corpuscles.

The spleen presents no marked alterations from the natural condition.

The mucous membrane of the stomach is intensely congested, giving it a tumefied and reddened appearance, and in some places quite dark color.

The accumulation of blood is chiefly in the small veins and capillaries. In some cases spots of blood extravasation or ecchymoses exist, and the stomach generally contains more or less of a dark brown or black liquid, which is identical with the black matter vomited before death. This dark liquid is made up of serum, altered blood corpuscles, epithelium, and the debris of ingesta. The duodenum and upper part of the small intestine present more or less of the same changes in the mucous membrane and its contents, as in the stomach. The glands of the ilium and mesentery show no marked morbid changes.

The kidneys are found more or less congested in nearly all the cases examined. The epithelium of the tubules has undergone some granular degeneration; the cortex is often swollen, yellowish-white, with congested and hemorrhagic spots; and small points of suppuration are sometimes, though rarely seen. The urine contains but little urea and uric acid, their places being supplied by leucin and tyrosin, and very generally a considerable amount of albumen.

It also contains both blood and bile pigments, giving it a deep reddish yellow color. Dr. Schmidt has also called attention to some changes in the supra-renal capsules, and in the semilunar and other ganglia of the sympathetic nerves, none of which, however, appear to be peculiar to yellow fever patients.

*See Practice of Medicine by Roberts Bartholow, M. D., page 722.

The blood in yellow fever undergoes no characteristic changes, unless it be a rapid crenation of the red corpuscles, with diffusion of the hæmoglobin in the serum and other parts of the body * Dr. J. G. Richardson, of Philadelphia, claimed to have discovered a peculiar *bacterium* in the blood; but his observations have not been confirmed by other competent observers.

Special Pathology.—Both the symptoms during life and the post mortem appearances, indicate that in yellow fever the general properties of the tissues, and consequently, the molecular changes concerned in nutrition, disintegration and secretion, are profoundly altered, in such directions as to increase the susceptibility and diminish the vital affinity, in consequence of which the molecular changes are universally retarded or perverted from their natural direction.

The direct action of the cause or causes in increasing the susceptibility is shown in the intensity of the febrile excitement, while the impairment of the vital affinity is shown by the impairment of the red blood corpuscles, the molecular degenerations, the arrest of secretions, and especially by the general tendency to hemorrhages of a passive character. Besides these general morbid conditions, there is something in the nature of the efficient cause, that gives it a special tendency to establish a grade of inflammatory, or at least, irritative action in the liver, kidneys and mucous membrane of the stomach and duodenum. This is shown as clearly by the almost uniform presence of epigastric tenderness, scanty and albuminous urine, and morbid bile during life, as by the changes seen in these organs after death. Yet the morbid actions set up in these several important organs, are not the *cause* of the general fever, but only an accompaniment, developing during its progress and often adding much to its fatality.

I regard them as bearing the same relation to yellow fever as the morbid condition of the glands in the ilium and mesentery does to typhoid fever.

Treatment.—The rational indications for treatment in this fever are: first, to suspend the further action of the exciting cause ; second, to lessen the intensity of the general excitability, and maintain the natural secretory actions; third, to counteract the development of local complications in the stomach, liver and kidneys; and fourth, to sustain the patient with proper nourishment, adjusted to the different stages of the disease. In fulfilling the first of these indications, the same attention to the supply of pure air, the rigid enforcement of cleanliness, and the prompt removal of all evacuations, is necessary, as I explained fully when speaking to you of the first indication in the treatment of typhoid fever. As high atmospheric temperature is, at least, one of the important elements in the causation of the disease, keeping the temperature of the sick-room reduced as near the standard of healthy comfort as possible, is very desirable, and the beneficial effects of this, may be increased by frequent sponge-baths, and cold applications to the head, and as complete rest as possible both for body and mind. If, in addition to high temperature, we have, as a specific cause, some modification of malarious infection pervading the atmosphere, whether it be in the form of *germs* or not, the proper use of disinfectants may be of some value. On the proper fulfillment of the several indications I have named, will depend, in a great degree, the success of the treatment.

In proportion as the intensity of the morbid excitement can be moderated, and the natural molecular and secretory actions maintained during the first three days, in the same degree will the subsequent progress of the disease, be rendered safe.

*See paper in the New York Medical Journal for February, 1879, by H. D. Schmidt, M. D., of New Orleans.

Concerning the best means for accomplishing this purpose, there is now and ever has been, great diversity of opinion among those who have had the best opportunities for practical observation and experience. During the earlier epidemics in the days of Drs. Rush, Physic, Hosack and Bard, covering the half century preceding 1825, the purely antiphlogistic methods of treating disease, were dominant, and the object now under consideration was sought to be accomplished by free venesection and evacuants. A large proportion of the more severe cases were bled freely, when seen during the first twenty-four hours from the commencement of the attack, and, as was claimed by Dr. Rush and many others, with decided benefit. It was applicable, however, to the first and second days only; if practised later, it only served to hasten the stage of dangerous prostration. It was claimed by the advocates of venesection, that free bleeding at the commencement of an attack, lessened the danger of copious hemorrhages from the stomach and other parts later in the progress of the case; and this was doubtless to some extent true. Yet Dr. Fenner tells us that he saw a man die with copious black-vomit after having lost near 4 litres or 100 ounces of blood by venesection, and cups during the first stage. As the strictly antiphlogistic methods of treatment lost their popularity, the abstraction of blood in the treatment of yellow fever came to be limited to leeching and cupping, and the more active evacuants gave place to arterial sedatives, alteratives and Peruvian bark or quinine. So early as the year 1800, two eminent Spanish physicians gave large doses of Peruvian bark, amounting in all to between 180 and 250 grams (℥vi and ℥viii) during the first forty-eight hours after the initial chill, by which they claimed extraordinary success in arresting the progress, and curing severe cases of this fever. They gave from 8 to 12 grams (℥ii to ℥iii) of the bark every two hours, commencing immediately after the initial chill.*

During the prevalence of the fever in New Orleans in 1847, and from that time to 1853, Dr. E. D. Fenner and others gave from 0.66 to 2.00 grams (gr. x. to gr. xxx.) of quinine at once, and repeated the dose from one to three times in the twenty-four hours, during the first two or three days of the fever, with the effect of rapidly reducing the temperature and general excitement, causing free perspiration, and arresting the further progress of the disease. The epidemic of 1847, however, was mild in its character, and so were all the seasons of the recurrence of the fever from that date until the very severe prevalence of the disease in 1853. During the epidemic of the last named year, Dr. Fenner himself tells us that he could not obtain the same beneficial effects from the large doses of quinine, and was obliged to substitute other and milder means in the management of the disease.† I should remark that Dr. Fenner and others, in giving the full doses of quinine, generally gave some calomel with them. Since the promulgation of the more recent doctrines concerning the treatment of fevers, mainly by antipyretics, we have had the severe epidemics of yellow fever of 1867 and 1878–79. In the latter, more especially in New Orleans, the antipyretic treatment by cold baths, packs, the wet sheet, and cold water spray, was tried in all forms and with all degrees of persistence, but with no specific results other than the temporary reduction of the temperature. And one physician who had invented a most ingenious bed and apparatus for carrying out antipyretic treatment, heroically died from the disease while endeavoring to demonstrate the value of his apparatus, and the particular treatment for which it was designed. As the

*See Philadelphia Medical and Physical Journal for 1808. Also Transactions of the Amer. Med. Association. Vol. vii, p. 546.

†See Report on the epidemics of Louisiana, etc., by E. D. Fenner, M. D., in Trans. Amer. Med. Association, Vol. vii. p. 421.

the tendency to develop local hyperæmia and irritation in the stomach, liver and kidneys, causes in many cases a persistent tendency to reject all remedies and nourishment by vomiting, we must practically unite the measures calculated to repress or lessen these important local complications, which I have designated as the third object to be accomplished, with those for fulfilling the second. In doing this, if called to a patient with severe yellow fever soon after the initial chill, we find the epigastric distress, tenderness, and tendency to vomit, prominent symptoms; from six to twelve leeches may be applied to the epigastrium, or in their absence, free cupping over the dorsal and lumbar portions of the spine, with mustard sinapisms to the epigastric region; hot mustard bath for the feet, with cold cloths to the head; and if the skin be very hot and dry, cold sponging over the face, neck, and trunk of the body, while internally may be administered, for the triple purpose of helping to allay gastric irritation, lessening general febrile excitement, and promoting the more important secretory actions, the two following formulæ:

℞	Acidi Carbolici	0.5 grams	gr. viii
	Glycerinæ	15.0 c. c.	ʒiv
	Tincturæ Gelsemii	15.0 " "	ʒiv
	Tincturæ Veratri Viridis	6.0 " "	ʒiss
	Tincturæ Opii Camphoratæ	60.0 " "	℥ii
	Aquæ	60.0 " "	℥ii

Mix, and give four cubic centimetres (fl ʒi), or a teaspoonful every two, three or four hours, according to the urgency of the symptoms. Also,

℞	Hydrargyri Chloridi Mitis	0.8 grams	gr. xii
	Sodii Bicarbonatis	2.0 "	" xxx

Mix, divide into six powders; one of which may be given, mixed with a very little moistened sugar, half way between the doses of the liquid formula just given. If the case is located in an actively malarious district, as shown by the coincident prevalence of cases of ordinary intermittent and remittent fevers, I would give as early as possible in addition to the foregoing, one or two full sedative or antipyretic doses of quinine, administering it either hypodermically, or by rectal enema.

If the bowels do not move until two hours after the last of the six powders are taken, a laxative should be given sufficient to procure one or two free evacuations. As soon as this has been accomplished, the action of the skin and kidneys may be further promoted by giving an equal mixture of liquor ammonii acetatis and nitrous ether, in doses of four cubic centimetres, or one teaspoonful, between the doses of the carbolic acid formula. The efficient carrying out of the measures I have detailed, will necessarily occupy the first two days, at the end of which time, if any beneficial results are being produced, all the more important symptoms will have been mitigated. The temperature will have been lowered, the restlessness and pains abated, the urine more free with little or no albumen, the skin moist, and the patient more restful.

If such has been the result, the veratrum viride should be excluded from the carbolic acid formula, lest its further use should increase the sedative action so far as to renew the gastric irritability and vomiting. In other respects the treatment may be continued until either convalescence is established, or the yellow color and other symptoms of the stage of apyrexia begin to appear. If this period of calm and rapid subsidence of the febrile symptoms commences, the leading object is to pre-

vent the congested gastric veins as well as the smaller blood-vessels generally, from yielding so far as to allow the escape of blood in the form of black vomit or other hemorrhagic appearances. The patient must be kept entirely at rest, and only the most bland and unirritating materials allowed to enter the stomach for nourishment. The medicines administered should be such as are calculated to sustain the tone and integrity of the vascular system, and lessen the tendency to further deterioration of the blood itself. Moderate but frequently repeated doses of the tincture of chloride of iron given well diluted; the oil of turpentine emulsion carefully prepared as I directed when speaking of the treatment of typhoid fever; and small doses of quinine or strychnine with a mineral acid, would appear to constitute the best means for accomplishing the object just stated. But whichever of these or other remedies are chosen, the mode of administration must be such as is least likely to provoke vomiting, or any degree of irritation in the stomach. The required amount of either quinine or strychnine could be readily given by hypodermic injection, and much of the nourishment needed might be given in the form of enemas.

If this critical period is passed without being followed by copious hemorrhages, as indicated by vomiting of dark "coffee ground" material and rapid prostration, the subsequent management may be similar to that of a moderate grade of typhoid fever, only being more careful to insist on the most bland and simple nourishment, with as perfect rest of body and mind as possible, until convalescence is fully established. Throughout all the active stage of the disease, the patient's thirst should be alleviated chiefly by frequent bits of ice, with here and there a spoonful of cold water, or of orange-leaf tea; and the nourishment should be chiefly milk and lime-water, given in doses of only one or two tablespoonfuls, but frequently repeated. If any meat broths are allowed, they should be properly seasoned with salt, and given in the same limited doses as the milk and lime-water.

In the more advanced stages, if a gentle stimulant is required, small doses of well prepared tea or coffee will supply the want better than any other articles. Solid food of any kind appears to be unsafe, until after full convalescence, and even then must be given with caution. During the active stage of some cases, excited delirium and persistent wakefulness exist, and may be relieved by using judiciously morphine, combined with atropia hypodermically. But morphine and other preparations of opium must be used with great caution, lest they help to check the action of the kidneys. The recovery after full convalescence is generally rapid, and not attended by any troublesome sequelæ.

Prophylaxis.—In relation to the best means for preventing the development and spread of yellow fever, I would state that the most important of all the measures devised for these purposes, are such as have for their object, the removal of one or more of the conditions known to be necessary for the production and spread of the disease.

Of these conditions, the one most readily under human control is the contamination of the atmosphere from local sources of vegetable and animal decomposition. It is well known that the chief sources of such decomposition are imperfect and uncleanly sewers or cess-pools, foul and stagnant water, and low, moist ground, rich in vegetable matter.

To remove these sources of atmospheric impurity early in each year, and keep them thoroughly removed until the close of the warm season, and thereby prevent the supply of local material on which the essential cause of yellow fever depends for its propagation, is the *only reliable* safeguard against the development of this disease in any place within the geograph-

ical range of its prevalence. If this is neglected until the atmosphere of any locality becomes filled with miasms as a pabulum for the fever poison, and the summer temperature prove continuously high, the disease will prevail and spread in defiance of all the inland quarantines that can be devised. But if a sufficient degree of cleanliness in regard to streets, alleys, gutters, sewers and stagnant waters, to prevent the atmosphere from becoming filled with the products of decomposition and impurities, is secured early in the season, and faithfully maintained until the frosts of autumn, there will be no danger of the prevalence of yellow fever, either by importation or otherwise. The point of vital importance is to *prevent* the development of the noxious material that constitutes the pabulum on which the essential cause of the disease feeds or out of which it originates.

In addition to this, the municipal and health authorities of every important city or town on the coast of the Gulf from the Mexican boundary to Charleston on the Atlantic; on the Mississippi from New Orleans to St. Louis; on the Red River below Shreveport; on the Ohio below Pittsburgh, and on the principal lines of railroad in immediate connection with such cities and towns, should deliberately select the nearest unoccupied, dry, elevated place; containing pure air and good water, and as readily accessible as possible, to which all families willing to go could be speedily removed from an infected street or section of a town or city, and accomodated in tents or other temporary structures until they could safely return to their homes.

Wherever this principle of speedy removal was acted upon by our army, it proved entirely successful in stopping the spread of the disease among the soldiers, and its imperfect and limited adoption at Memphis in 1879, was of great value.

If the proper places were carefully selected beforehand, and a supply of tents or other material kept under the control of the proper authorities, so that on a first appearance of the disease in a neighborhood those exposed could be removed without delay, and ordinary supplies of provisions for the poor dealt out *only* at the camp or camps, there would be but little difficuly in limiting the local spread and fatality of any epidemic. While such camps would chiefly operate for the benefit of the poorer classes (and wherever it should be possible to find the proper grounds on railroad lines within a radius of from ten to twenty miles of the city, many of the workingmen could go in every morning and continue many kinds of work), all who were able to provide for themselves and their families away from home and were not thoroughly acclimated, should be encouraged to go early and freely, the only condition imposed being that they should not stop until they had passed entirely north of the climatic zone of the yellow fever. The only internal or inland quarantine regulations required are the selection of suitable and well prepared healthy stations a few miles from each of the more important cities on the great lines of travel, whether by river or railroad, where boats and trains shall halt long enough for inspection, and if any are found sick of the fever they shall be transferred directly to the station and cared for, the boat or car being thoroughly ventilated, and allowed to proceed with all the well persons, to any proper northern destination. The great northwestern region bounded on the east by Waukesha, Mackinac and Marquette, extending indefinitely westward over the northern peninsula of Michigan, northern Wisconsin and Minnesota; and the whole Alleghany range in the northeast, from Virginia to the Adirondacks, are sufficient to accommodate every unacclimated person in the lower Mississipi Valley and in our southern sea-

port cities; and they could no more spread the yellow fever in those regions than intermittent fever could be spread on Mount Washington.

The same principles apply to commerce and business. There is no positive evidence whatever, that the disease is ever transmitted by simple contact with the sick, nor by either articles of clothing or merchandise that have been freely exposed to the air outside of an infected locality. It is only when the *infected air* of the locality where the disease is prevailing, is shut up in the hold or apartments of a ship, boat or car, or boxed up with goods in boxes or trunks, that it can be carried to distant places and retain its active properties. And even when so carried, it must be let out in an atmosphere in the new locality at the proper high temperature and containing the necessary local miasms or impurities, or it becomes utterly harmless. All that is necessary, therefore, is to have all ships, boats, and cars, carrying freight, stopped at suitable places outside of populous towns, inspected, all parts thoroughly ventilated and cleansed; and where goods had been packed in bales, boxes, or trunks, the same opened and aired before they are received by the parties to whom they are consigned.

The proposition that, on the appearance of an epidemic in any given place, all persons not being fully acclimated or protected by previous attacks of the disease, should be encouraged to immediately remove to healthy districts; such as were pecuniarily able, to go beyond the yellow-fever zone; and those who were not able, to go into well-selected camps in the vicinity, was subjected to a pretty fair test in Memphis, in the summer of 1879.

On the outbreak of the epidemic the utmost facilities were afforded for all who wished to go to the North, and three camps were established in judiciously selected localities, within twenty or thirty miles of the city, in which many hundreds of the poorer classes took refuge. The result was most gratifying. Those in the camps remained perfectly free from the disease; only a very few of those who fled to the North were taken sick after their departure, and yet the population left in the city was reduced to ten or twelve thousand, and the aggregate number of deaths from the fever during the whole season was only about 550, instead of 2,500, as during the epidemic of 1878.

The suggestion to carefully select stations in proper places along the lines of travel and commerce, both by rivers and railroads, at which boats or cars from infected places, should be stopped for inspection, and, when necessary, thoroughly ventilated and cleansed, with the removal of any found sick to a hospital for proper care, while the well were allowed to proceed on their way, thereby substituting systematic inspection, with enforcement of ventilation, cleanliness, and care of the sick, in the place of quarantines, has been tested only to a limited extent. A station of this kind was established during the summer of 1879, at Island No. 1, below Cairo, and in a less perfect manner on the Ohio, below Louisville and Cincinnati. The quarantine station, fourteen miles below St. Louis, was also managed partly on the same plan. The results at each of these places were most beneficial, and fully demonstrated that if the plan of establishing *inspection stations*, with temporary hospital accommodations attached, should be carried out in the systematic manner I have suggested, it would afford a far better protection against the spread of the disease, from one place to another, than the ordinary methods of quarantine.

LECTURE XVIII.

Erysipelas—Its History, Causes, Symptoms, Diagnosis, Prognosis, Pathological Anatomy, Special Pathology, Treatment and Prophylaxis.

GENTLEMEN:—Erysipelas presents itself to us in two aspects. In one, it has the characteristics of a general acute disease, accompanied during its progress by a peculiar local inflammation. In the other, it is chiefly characterized by the local inflammation occurring in connection with wounds, injuries, etc., not necessarily preceded or accompanied by general fever. The first is called *idiopathic erysipelas*, and the second, *traumatic*. The French designate the one as medical and the other as surgical erysipelas. It is the first only that will occupy our attention at this time, as the second is always fully considered in the department of surgery. Sporadic cases of idiopathic erysipelas are met with in general practice every year, and at times it assumes an epidemic form and extends its prevalence over large districts of country. One of the most noted of these epidemics prevailed in our country from 1841 to 1846. During those years it extended over large portions of Vermont, Massachusetts, New York, some parts of Pennsylvania, Ohio, Michigan, Illinois, and Indiana. It commenced in the Eastern states in 1841, extended westward through New York with great severity during 1843, '44, and invaded many places in the states intervening between New York and the Mississippi, between 1844–46.

Hirsch alludes to this epidemic as extending over a great part of North America, and both he and Zuelzer, in his chapter on erysipelas in Ziemssen's Cyclopædia, intimate that it was not true erysipelas, but "an acute infectious disease closely related to diphtheria."*

As it was my fortune to see some part of that epidemic, in the years 1843–44, as it prevailed in Binghamton, New York, where I was then practicing, I must differ from this opinion of these learned writers. The cases that came under my observation presented all the symptoms characteristic of erysipelas in a strongly marked degree, while nothing peculiar to diphtheria was observed at any stage of their progress, neither did I see a single sequel usually seen after diphtheritic attacks.

The disease as it prevailed in Vermont, New Hampshire, and other parts of the New England States, was fully and accurately described by Drs. J. A. Allen, Charles Hall, and George J. Dexter; in the Western part of New York by Dr. Sanford B. Hunt; in Indiana by Dr. George Sutton, and in Illinois by Dr. D. Meeker, and I have failed to find a single allusion by any of these writers to a diphtheritic exudation, either upon the fauces or elsewhere, or to any symptoms specially analagous to those of diphtheria.†

Epidemics of erysipelas have prevailed and been accurately described under various names ever since the days of Hippocrates.

Epidemics of the disease occupying limited districts have occurred in almost all parts of this country, at different periods from the first settlements to the present time.

An epidemic of considerable severity prevailed in this city in the sum-

* See Ziemssen's Cyclopædia, Vol. II, p. 424.

† For a more full account of this epidemic, see Copeland's Dictionary of Medicine, edited by Charles A. Lee, M. D., Vol. I, pp. 954-5-6-7.

mer and autumn of 1863, and also in many other places in this and the adjoining States during the years 1863–64.*

During the time the disease was prevailing in this city, in the latter part of the summer and autumn of 1863, the water in the Chicago River had become so impregnated with the blood and offal from slaughtering-houses on its banks, that the fish all died, and the stench from it rendered the air offensive to the nostrils over large portions of the city. Many of the physicians attributed the erysipelas, as well as a coincident unusual prevalence of typhoid fever, to this impregnation of the air with putrid animal matter.† As it was prevailing at the same time, however, in remote interior districts, it is probable that other causes at least contributed to its production here. A fact of great practical importance is, that in nearly all the epidemics of erysipelas, women undergoing confinement in child-bed are extremely liable to be attacked with puerperal fever or, in other words, erysipelatous inflammation of the peritonæum. This was notably true in the great epidemic from 1842–46. According to Drs. Hall and Dexter, in the county of Caledonia, Vermont, thirty cases of puerperal peritonitis occurred within a few weeks, of whom only one recovered. In the town of Bath, N. H., with not more than fifteen hundred inhabitants, twenty mothers died with the puerperal disease.‡ The same connection between the prevalence of erysipelas and puerperal fever was noticed in all parts of the country; and in all places the puerperal disease was exceedingly fatal. It is well for each of you to remember this connection between erysipelas and puerperal fever, and be exceedingly careful about attending cases of obstetrics while at the same time attending cases of erysipelas, as there is much evidence going to show that a physician, under such circumstances, may convey the specific infection to the lying-in woman.

Causes.—In a general sense, I may say that all the circumstances which have been mentioned as favoring the development and spread of typhoid and typhus fevers, also act as predisposing influences in favoring the occurrence of erysipelas; yet it is highly probable that the immediate or specific cause of the latter is a subtle organic poison or idio-miasm, derived from the retrograde metamorphoses of animal matter, which may take place either within or without the living body. In many of the sporadic cases the specific cause is evolved in the system by derangement of the processes of disintegration and elimination. Whatever interferes with the natural tissue changes, by preventing the proper oxidation of the tissue materials and their conversion into the forms capable of ready excretion or elimination, will favor this result. Consequently, you will find those who habitually use alcoholic drinks; those living in small, damp, and poorly-ventilated apartments; and those confined to over-crowded rooms, with inadequate supply of air, to be more liable to erysipelatous attacks. Cases arising from the absorption of poison generated on the surface of ill-conditioned wounds, ulcers, etc., are numerous among the traumatic forms of the disease. Very strong proof has been given that sewer-gas is capable of sometimes causing attacks of the disease. For instance, beds standing over or alongside of sewer-pipes from which gases escaped, have been found to impart erysipelas to their occupants, but which was immediately changed by simply repairing the pipes.‖

Dr. Orth claims to have induced erysipelas in rabbits by inoculating

* See Report on Practical Medicine and Epidemic Diseases, by N. S. Davis, M. D., Vol. Trans. Ill. State Medical Society, 1864, p. 14.

† See a short but interesting article on this subject, by Dr. E. Andrews, in the Chicago Medical Examiner, Vol. V, p. 17. 1864.

‡ See Account of the Erysipelatous Fever, as it appeared in the northern part of Vermont and New Hampshire in 1842–43, in Amer. Jour. Med. Sciences, Jan., 1844.

‖ See Ziemssen's Cyclopædia of Practical Medicine, Vol. II, p. 440.

them with the serum from the vesicles on an erysipelatous surface, and also by using the blood of patients affected with the disease. While it is not difficult to account for cases of sporadic and traumatic erysipelas, by supposing the existence of a local animal poison, it is not so easy to see how such a poison could be generated and diffused so widely as to cause the prevalence of epidemics over extensive districts of country. It is a well-known fact, however, that a variable quantity of organic albuminoid matter generally exists in the atmosphere; and I see no reason why, under some combination of atmospheric conditions, this might not be so changed as to constitute the special infection for producing an epidemic of erysipelas.

Neither age, sex, nor season of the year appear to exert much influence over the susceptibility to this disease. The greater number of cases have occurred during the active period of adult life—that is, between 20 and 45 years of age. But cases are liable to occur at any period of life, between the first few days after birth and old age.

Some have claimed that a larger number of females suffer from attacks of the disease than of males. There is, however, no uniformity in this respect; for close examinations of the results of several epidemics show that in some seasons the majority of those attacked were males, and in others females. While the prevalence of the disease is not limited to any particular part of the year, it has occurred most frequently in the spring and autumn. One attack of erysipelas does not in any degree lessen the susceptibility of the individual to subsequent attacks. There is no proof that the disease is communicable from one individual to another by personal contagion through the atmosphere; but it is readily communicated by actual contact or inoculation.

Symptoms.—Idiopathic erysipelas, whether occurring sporadically or in the midst of an epidemic, usually begins with a feeling of indisposition similar to that which precedes the active stage of most febrile affections. This is seldom noticeable more than from one to three days, when a cold stage, varying from slight chilliness to a decided chill of from fifteen to forty-five minutes' duration, marks the commencement of the active phenomena of the disease. The brief, and generally slight chill, is immediately followed by more or less pains in the head, back, and limbs; some flushing of the face; dryness and heat of the skin; increased frequency and fullness of the pulse; some thirst; a white fur on the tongue; scantiness of urine; and quiet or inactive state of the bowels, with loss of appetite and some thirst.

In the more severe cases the headache is severe and not unfrequently accompanied by vomiting of matters mixed with bile. In cases of average severity the febrile symptoms develop with such rapidity that at the end of the first twenty-four hours the temperature ranges between 39° and 40° C. (102° and 104° F.), and the pulse from 90 to 110 per minute. A moderate increase usually continues until the end of the third day, when the general febrile symptoms reach the climax of their intensity, the temperature being in many cases 40.5° or 41°C. (105° or 106° F.), the pulse 120, and the urine containing more or less albumen. During the fourth, fifth, and sixth days the aggregate of general symptoms remains nearly the same, although the temperature may fluctuate to the extent of two or three degrees every day, the maximum being in the morning quite as often as in the evening. Decided defervescence usually commences between the fifth and seventh days, and progresses to the full establishment of convalescence, between the ninth and eleventh days.

In some instances, coincident with the initial chill, or immediately after it—but more generally in the latter part of the first day of fever—the

patient complains of some soreness in the fauces, which on inspection present a deep red appearance, with slight tumefaction of the mucous membrane. Sometimes a sense of soreness, stiffness, or tension is felt in some part of the cutaneous surface, but at first no redness. In most cases, on the morning of the second or third day, a deep red spot has made its appearance on the face near the wing of the nose, or at the lobe of the ear, the nates, the vulva, or some part of the extremities, usually at the place that had been previously feeling tense and sore. The red spot is at first small, but accompanied by tumefaction, heat, and soreness, and is bounded by an abrupt, well-defined margin. It commences far more frequently on the face than on any part of the body or extremities. With the appearance of the inflammation on the surface the soreness and redness of the fauces disappear; but the general febrile symptoms continue unabated, or increase in intensity. The local inflammation extends rapidly in all directions, and usually covers the whole face, ears, and mastoid spaces in from two to three days; and in severe cases it continues its spread over the whole head and neck, to the shoulders and back. In extending over the face, the tumefaction from infiltration into the subcutaneous areolar tissue is sufficient to close the eyelids and make the whole surface appear intensely red and much swollen, while vesications or blisters, varying in size from the circumference of a pea to that of a hickory nut, make their appearance, mostly upon the cheeks, forehead, and ears. If the inflammation extends over the broader surfaces on the trunk of the body, or on the lower extremities, the blisters are sometimes much larger; and though generally filled with a transparent serous fluid, yet in unusually severe cases the fluid is more turbid and dark purple, from intermixture of blood. The external erysipelatous inflammation generally ceases its further extension in from five to seven days, and from that time declines, *pari passu*, with the decline of the general fever. As soon as the inflammation begins to abate, the redness changes to a darker hue, the swelling diminishes, the vesicles shrivel and soon become dry and covered with a thin scab or crust, composed of the dried serum and shriveled cuticle, and of a dark brown color. The tumefaction also diminishes rapidly, allowing the eyelids again to open; and by the time defervescence is complete, the whole recently red, burning, and swollen surface presents a shrunken, dingy, or brownish aspect, rough from exfoliating cuticle, but free from heat and pain.

While the description I have now given you applies with sufficient accuracy to the great majority of cases of erysipelas, as they are met with by the general practitioner, there are many and important deviations from it in individual cases. One of these deviations consists in the presentation of a milder grade of general fever, a slower spread of the local inflammation, less tumefaction, little or no vesication, but persistent in duration until large surfaces had been occupied or passed over, the redness and heat disappearing from the parts first attacked, while it is still extending to new parts on its margins. I recollect one nursing infant on whom the inflammation spread thus superficially, but persistently, until it had extended over every square inch of its cutaneous surface, and occupied nearly two weeks of time; ending finally in diarrhœa and fatal exhaustion. In a very few instances of this superficial variety I have seen the inflammation, after having passed successively over the face and scalp, return to the part first attacked and go over the same surfaces a second time; but all of this variety of cases coming under my care have recovered, except the infant I have just mentioned. During the prevalence of erysipelas in this city in 1863, a case occurred in the practice of Dr. W. H. Byford, in which an adult male, aged 45 years, had a regular attack of fever, followed by

erysipelatous inflammation, commencing on the nose and spreading rapidly until it had occupied the whole face and scalp, and seven days of time. Defervescence then commenced, and by the thirteenth day convalescence appeared to be fully established. In less than forty-eight hours he was again attacked by a chill, followed by fever and a reappearance of the erysipelatous inflammation on the nose, just as at first. The febrile symptoms continued, and the external inflammation spread over precisely the same surface as in the first attack, and completing its course in five days, declined so rapidly that on the seventh day he was again fully convalescent. But on the very next day he was again attacked in the same manner, by a chill followed by fever, and a fresh eruption of the erysipelatous inflammation on the nose, which again, for the third time, regularly extended over the whole face and head, presenting every characteristic of the disease, and again completing its course in seven days. The first attack commenced on the 5th of June, and the third ended on the 3d of July, soon after which the patient was sent out of the city for a change of air, and he remained free from the disease. He was treated from the beginning to the end with efficient doses of the tincture of chloride of iron. Dr. Byford, in recording the case, remarked that in a practice of twenty-five years he had seen no parallel case of relapsing erysipelas.*

Another deviation from the ordinary typical course of the disease consists in a greater amount of subcutaneous infiltration and consequent swelling, making the skin very tense, dark purplish color, the vesicles filled with dark bloody serum, and the accompanying fever more of a typhoid character, with more or less delirium, subsultus, and cold extremities. In these cases there is apt to be suppuration in those parts of the areolar tissue most tensely engorged, such as the loose tissue under the eyelids, behind the angle of the jaw, and in the scalp.

Three such cases came under my care in the Mercy Hospital during the epidemic of 1863. In two of them the destruction of the tissue under the eyelids by suppuration was so extensive that when recovery had taken place, the contraction of the cicatrices caused a moderate eversion of the tarsus of the lids, with inability to completely close them.

A still more important deviation from the ordinary course of the disease is presented by those cases in which the erysipelatous inflammation, instead of appearing on any part of the cutaneous surface, attacks the fauces, tongue, pharynx, and sometimes the bronchial tubes and membranes of the brain. During the severe epidemic of 1843–44 there were many cases in which the whole force of the inflammation fell upon the fauces, tongue, and pharynx, causing those parts to become dark red, and so much swollen as to render breathing and deglutition extremely difficult. The lips and swollen tongue became early covered with a thick, dry, and black coating, so prominent that in many places the disease was popularly styled "the black tongue." When the inflammation attacked the bronchial tubes there was severe burning pain in the chest, very distressing cough, with great difficulty of breathing, and rapid exhaustion. If the membranes of the brain became involved, it gave rise to severe pain in the head, early and excited delirium, very frequent pulse, followed in two or three days by coma, dilated pupils, and death. A very large proportion of all those in which the local inflammation failed to develop on some part of the cutaneous surface, but attacked more internal structures, terminated speedily in death. A much smaller proportion of this class of cases was noticed during the epidemic of 1863–64 than in that of 1843–44. Most writers state that

* See Chicago Medical Examiner, Vol. IV, pp. 495-6-7, 1863.

the erysipelatous inflammation, after having been established in some part of the cutaneous surface, is liable to suddenly recede and attack the stomach, meninges of the brain, or other internal structures; and it is probable that such cases have been occasionally observed, though none have ever come under my own observation.

Diagnosis.—In most cases erysipelas is easily distinguished from all other acute febrile affections. The appearance of an inflammation on some portion of the surface soon after the development of general fever, presenting a deep red color and abrupt margins, with burning pain, and a disposition to spread by continuity, is so characteristic or unique, that the most inexperienced observer can hardly err in his diagnosis. And yet I have met with several cases of acute eczema rubrum, especially on the face, that had been mistaken for erysipelas and treated accordingly. But if you remember that acute eczema simply presents a red surface closely studded with minute pointed vesicles, accompanied by fiery heat and itching, the red surface having no abrupt margin in any part of its circumference, and the minute vesicles weeping a serous fluid whenever they are broken by friction or scratching, and accompanied by very little, if any, general febrile symptoms, you will exhibit extraordinary skill in blundering if you confound it with erysipelatous inflammation.

Erythema is distinguished from erysipelas by its presenting a simple red surface, with little or no tumefaction, accompanied by no general fever, and without an abrupt margin. When the inflammation accompanying erysipelatous fever is restricted to the fauces, tongue, and pharynx, there may be some danger of confounding it with either catarrhal or diphtheritic inflammation of those parts. From the first, however, it is distinguished by the deeper, darker redness of the inflamed surface; its more rapid spread and the greater temperature of the parts, and the far more violent and dangerous general febrile symptoms accompanying it. From the second it is distinguished by the absence of any diphtheritic membranous exudation; by the greater dryness and heat of the surfaces involved; and the more speedy formation of a dark brown or black coating over the swollen tongue and fauces.

Prognosis.—Idiopathic erysipelas, as it occurs sporadically or in mild epidemic form, is a self-limited general febrile affection, almost always tending to recovery, and consequently productive of a very low ratio of mortality. But in its more severe epidemic forms the mortality occasioned by it has been very great. Striking examples of the latter were presented in many of the places visited by the disease during the wide spread epidemic that prevailed from 1841 to 1846. The epidemic of 1863–64 was of milder character. During the six months ending March 1st, 1864, there came under my care in the wards of the Mercy Hospital in this city, twenty-one cases, and forty-five more in private practice. Of these sixty-six cases only one died. The one fatal case was a female child only four weeks old, the symptoms accompanying which I have already alluded to.* It may be stated as a general rule that erysipelatous fever, accompanied by inflammation on any part of the cutaneous surface, tends strongly to recovery, the convalescence being established between the seventh and fourteenth days. But when this variety of fever is attended by the development of inflammation in any of the internal membranes, whether mucous or serous, its progress involves great danger to the life of the patient.

Pathological Anatomy.—Fatal cases of erysipelas leave no internal

* See report on Practical Medicine and Epidemics, in the Transactions of the Illinois State Medical Society for 1864 p. 16.

changes of structure which are in any degree characteristic of this variety of fever. In different cases have been found all the usual appearances of inflammation of the meninges of the brain, pleura, peritoneum and other serous membranes; also of the mucous membranes in the throat, nasal passages, stomach and upper part of the intestines, as well as in the bronchial membranes and parenchyma of the lungs. But all these appearances resulted from internal complicating inflammations, and not from changes necessarily belonging to the erysipelatous affection. The blood has been described as thinner and darker color than natural, and sometimes containing a few motionless bacteria. The latter are found much more abundantly in the serum of the vesicles and that infiltrating the sub-cutaneous arealor tissue of those parts of the surface involved in the erysipelatous inflammation. They appear to be indentical, however, with the bacteria found in serous and other organic liquids undergoing deteriorative changes, having no connection with erysipelas or any other kindred disease. In a large proportion of the fatal cases, the spleen has been found engorged with dark blood and enlarged, and the cortical substance of the kidneys in a state of active hyperæmia.

Special Pathology.—The general character of the erysipelatous fever, together with the peculiar mode of development, spread, and disappearance of the accompanying cutaneous inflammation, furnish strong evidence that the disease arises from the presence in the blood of a specific materies morbi, which so acts upon the properties of the living tissues as to increase their elementary susceptibility and pervert in a peculiar manner the vital affinity, inducing thereby those singular molecular changes which so clearly distinguish the erysipelatous from all other grades of inflammation. The very general tendency of the disease to disappear spontaneously after from one to two weeks' duration, shows that the specific causative material is either incapable of continued propagation, or is rapidly destroyed and eliminated from the living system during the progress of the morbid processes which its presence has induced. But of the identity and nature of the specific poison, and of the exact mode of its elimination, no satisfactory knowledge has yet been obtained.

Treatment.—If the opinion I have just expressed concerning the dependence of idiopathic erysipelas upon a specific poison which has in some way gained access to the living tissues through the blood, is true, the leading indications for treatment are, to prevent the further introduction of the poison; and to aid in either neutralizing or expelling that which is already pervading the fluids and solids of the body. The first is to be accomplished by placing the patient and his immediate surroundings in as good sanitary condition as possible. The second, by keeping the secretory and eliminating functions as near naturally active as possible, and giving internally such specific or antiseptic medicines as experience has shown to be capable of exerting some influence over the progress of the disease. If called early, and the fever is active, with coated tongue, dry skin, scanty and high colored urine, and quiet bowels, I endeavor to promote the excretory functions by giving every three or four hours a powder containing the compound opium and ipecac powder and nitrate of potassium, each three decigrams (gr. v.) and calomel thirteen centigrams (gr. ii), until four doses have been taken, and follow them by a saline laxative sufficient to cause one or two intestinal evacuations. After this the bowels seldom need further prompting, and the action of the skin and kidneys may be sufficiently sustained by suitable doses of the spirits of nitrous ether. To exert a specific action upon the exciting cause in such a way as to lessen the severity and duration of the disease, we may give the tincture of the

chloride of iron, the sulphites of sodium and calcium, or the dilute sulphurous acid, in suitable doses and sufficiently frequent to freely impregnate the blood. In far the larger number of cases I prefer the tincture of chloride of iron, and commence giving it from the beginning of the treatment in doses of from 1.5 to 2.0 cubic centimetres (m. xxv to xxx) well diluted with sweetened water, and repeated every three or four hours, until the fever begins to decline, and the inflammation ceases to spread. Then the doses may be diminished or the interval between them increased, but the remedy should not be wholly discontinued until convalescence is well established. In many cases this treatment appears to arrest the further progress of the disease in three or four days. There are some cases in which this preparation of iron is not well borne, or is rejected by vomiting. In such cases I have substituted the sulphite of sodium in doses of six decigrams (gr. x), with 0.3 cubic centimetres (m. v) of the tincture of belladonna, in solution with mint-water, repeated just as often as in other cases I repeat the iron, and with excellent effect. In the epidemic of 1863, I treated some of the worst cases that came under my care, both in the hospital and out, with the sulphites of sodium and calcium, very satisfactorily.

It appeared to me slower in developing its effects than the iron, but none the less permanent.* If at any time during the progress of an attack of erysipelas, diarrhœa supervenes, it can be best controlled by giving the emulsion of oil of turpentine and tincture of opium, according to the same formulæ that I gave you when discussing the treatment of typhoid fever. In this city and throughout the larger part of the great interior valley of this continent, the local epidemics of erysipelas have been materially influenced by the co-existing presence of malaria, imparting to the fever a more remitting type, and to the external inflammation a more persistent disposition to spread. In all cases occurring under such circumstances, the sulphate of quinia should be given in moderate but efficient doses, in conjunction with the tincture of chloride of iron or the sulphites. In the earlier years of my residence here, when malarious or periodical fevers were much more prevalent within the city limits than in recent years, I met with such cases of erysipelas, and used quinine as an adjunct in their treatment, with the best results. When cases of erysipelas become complicated with important internal inflammations, such complication must be promptly treated by the same remedies that would be indicated by a similar grade of disease in the same parts under other circumstances. If the meninges of the brain or other serous membranes are attacked, accompanied by a high temperature and a firm pulse, one free bleeding by venesection in the first stage of its progress, will be found promptly beneficial in checking the progress until time is gained for other remedies to develop their action. I well recollect a case occurring in my practice during the notable epidemic of 1843, in the person of an adult male, of rather plethoric habit, and sanguine temperament. The general fever was active, and the inflammation attacked the face, spreading rapidly over the whole face and head, accompanied by much tumefaction and vesication. On the third day, while the inflammation was extending rapidly from the face over the whole scalp, the patient became wildly delirious, with contracted pupils, and a corded, tense pulse. I directly opened a vein in his arm and let the blood flow from a good-sized orifice, to the extent of more than one litre (fl. ℥xxx), with the most tranquilizing effect. The whole subsequent progress of the case was modified, and the patient made a good recovery.

* See Chicago Medical Examiner, Vol. IV, pp. 161-2, 1863.

Thus far I have said nothing in regard to local applications to the inflamed surfaces in erysipelatous fever, simply because I regard them as capable of exercising no control over the progress of the disease. When I first entered the ranks of the profession, nearly half a century since, very much importance was attached to local applications in this disease. It was thought that the extension of the inflammation might be arrested by deadening the whole inflamed surface with strong applications of nitrate of silver, tincture of iodine, strong solution of sulphate of iron, and even encircling the inflamed surface with narrow blisters. Others recommended the constant application of cold lotions, as solutions of acetate of lead, alum, and poultices made of cranberries.

During the first ten years of my practice, which included the epidemic years from 1841–46, I tried all these expedients faithfully, until I became fully convinced that none of them exerted any controlling influence whatever over either the local inflammation or the general fever. Consequently, during the last thirty years I have used no local applications to erysipelatous surfaces, except such as were calculated to add to the comfort of the patient by lessening the burning pain in the inflamed surface. For this purpose, keeping the surface moistened with a lotion made of equal parts of glycerine and rose-water succeeds well, and is pleasant to use. The next most comfortable application is cloths kept a little wet with a cold solution of acetate of lead.

A few years since, Dr. J. S. Whitmire, of Metamora, Ill., reported to the Illinois State Medical Society several cases of severe erysipelas, in which the disease was speedily arrested by the hypodermic injection of a few drops of a strong solution of carbolic acid at the margin of the inflamed surface.

It would be necessary to exercise much care in regard to the quantity of the carbolic acid introduced into the subcutaneous tissue, or its effects might be far more dangerous to the patient than the disease it is intended to cure. Throughout the whole course of the disease, proper attention should be given to the support of the patient by nourishment. Milk, beef-tea, thin wheat flour and milk gruel, and oatmeal gruel, constitute the best articles of nourishment. They should be given in small quantities at a time, but repeated sufficiently often to afford a fair degree of support, without accumulating too much in the stomach at one time. In those comparatively rare cases in which the erysipelatous inflammation develops in the fauces, pharynx, and tongue, rendering deglutition difficult or impracticable, the nourishment, as well as the medicines, must be administered mostly in the form of enemas. In the more malignant and typhoid grades of erysipelas, many recommend the free use of wine, brandy, and other alcoholic liquids.

I have seen many bad cases of erysipelas in which the habitual use of alcoholic liquids appeared to have been the chief predisposing cause; but I have never seen one in which the use of these liquids had any beneficial effect, either in sustaining the patient or in curing the disease.

Prophylaxis.—As the infection or specific cause of erysipelas is capable of adhering to clothing, bedding, sponges, instruments, and even the hands of the attending physician, great care should be exercised in having all such things as have been in contact with an erysipelatous patient thoroughly cleansed and disinfected, before allowing them to be used by others. Beds, mattresses, etc., can be most easily and reliably rendered innocuous by baking, or heating them to a high temperature in dry air. And, as practitioners, you should ever be particularly careful not to carry the infection on your hands or instruments to your obstetric patients. Whether

taking daily two or three moderate doses of the tincture of chloride of iron or of the sulphite of soda by well persons, during the prevalence of a severe epidemic, would prevent their being attacked—on the same principle that moderate daily doses of quinine often protect an individual from attacks of ague while living in a highly malarious atmosphere—remains to be determined by future experience and observation.

LECTURE XIX.

Diphtheria.—Its History, Causes, Symptoms, Diagnosis, Prognosis, Pathology, Treatment and Sequelæ.

GENTLEMEN:—The word Diphtheria, as used to designate a particular form of disease, is of recent origin, having been first applied to that purpose by Bretonneau in a valuable paper laid before the French Academy of Medicine, in 1821. While the name is thus modern, the disease has been recognized and described, with varying degrees of accuracy, from a very early period in medical history. The Grecian writers alleged that the disease originated in Egypt, and called it "*Malum Egypticum*," in the days of Homer and Hippocrates. An epidemic of the disease in Rome was recognized and described by Macrobius in the year 380, A. D. From that time to the middle of the sixteenth century, I find but few allusions to the disease. At the latter date, 1557, it appeared in Holland as an epidemic; in Germany, in 1650; in France and Italy, in 1749; and in England, from 1760 to 1769. While the descriptions of all these earlier epidemics are sufficiently accurate to render it certain that the writers were, for the most part, describing the disease now called diphtheria, it is equally evident that they often confounded with it scarlet fever and various forms of sore throat. Perhaps the most accurate of the early records is, "An Account of the Putrid Sore Throat," as it prevailed in London, by Dr. John Fothergill, published in 1769. The earliest account we have of this disease in America was written by Dr. Douglass, of the Massachusetts Colony, in 1736.* It undoubtedly prevailed in New York in 1771, and was pretty clearly described by Dr. Samuel Bard. From that time to 1831 we find nothing in the medical literature of our country which could be regarded as applying to true diphtheria; although it was more or less prevalent on the continent of Europe, and was being carefully investigated by Bretonneau, at Tours, from 1818 to 1821.

Dr. John Bell, of Philadelphia, alludes to the prevalence of an epidemic sore throat in that city in 1831, which was evidently true diphtheria. In 1856 the disease prevailed with great severity in San Francisco and the adjacent counties in California, and during the next two or three years epidemics appeared in various parts of New England, New York, and a large number of the Middle and Western States. According to Dr. L. N. Beardsley, of Milford, Connecticut, the disease commenced in the adjoining town of Orange, among the scholars attending a select school, and

*See the Practical History of a New Epidemical Eruptive Miliary Fever, with an Angina Ulcusculosa, which prevailed in New England in 1735–36. By Dr. William Douglass, of Boston.

with such severity that "fourteen cases out of fifteen, of those who were first attacked, proved fatal."* In April, 1858, it made its appearance in Albany, N. Y., and caused 167 deaths during the next eight months.† The disease began to attract attention in this city in 1858, and prevailed with considerable severity for three or four successive years.

During the same period of time, it showed itself more or less prevalent in almost every inhabited district of country from the Atlantic to the Pacific Ocean, and from the Lakes to the Gulf of Mexico. It prevailed in localities the most diverse in all their local conditions. Elevated, dry, thinly populated rural districts were visited as freely, and often as fatally, as the lowest alluvial valleys, or the most densely populated cities. It presented every gradation of severity, from fifteen deaths in sixteen attacks, as reported by Dr. Beardsley, of Connecticut, to only four deaths in one hundred and thirty-three attacks, as reported by Dr. Wm. L. Wells, of Milwaukee, Wis.‡ For additional facts regarding the prevalence of this disease during the years intervening between 1858 and 1860, and earlier, I refer you to an interesting report on the topography and epidemics of New York, by Dr. Joseph M. Smith, in the Transactions of the American Medical Association, Vol. xiii, p. 251, 1860. From that period to the present it is not probable that the disease has been entirely absent from all parts of the country for a single year. We find it occupying a place of more or less prominence in nearly all the annual tables of mortality in our cities, and accounts of its prevalence in some of the country districts have come to us every year. It seldom prevails in the same rural district more than two or three years in succession, without a period of exemption. And in the larger cities it presents its distinct waves of increase and decrease. For instance, in Philadelphia the number of deaths from diphtheria each year for eight successive years was, in 1872, 141; 1873, 106; 1874, 181; 1875, 656; 1876, 708; 1877, 458; 1878, 464; 1879, 321. In this city (Chicago) and in New York, the statistics of mortality indicate the same wave of increase in 1875, culminating in 1876, and receding through 1877–78–79.‖

Causes.— The predisposing causes or circumstances that appear to favor the prevalence of diphtheria, are, childhood and youth; dampness, with frequent changes in the thermometric conditions of the atmosphere; overcrowding of houses and consequent lack of ventilation; the presence of the products of the decomposition of organic matter, whether animal or vegetable; and the want of attention to personal cleanliness and domestic hygiene.

While it is true, that during the epidemic prevalence of diphtheria, persons have been attacked at all periods of life, from infancy to ripe old age, very much the larger number of cases occur in childhood. Of the 133 cases reported by Dr. Wells, 107 were in children and 26 in adults. Of the latter, one was 63 years of age; while the great majority of the former were between the ages of 2 and 10 years. Dr. Willard, of Albany, in giving an account of an epidemic in that city, reports 179 deaths, of which only *three* were adults, all the remainder being children, most of whom were under twelve years of age. From the statistics of the severe epidemic prevalence of this disease in England from 1857 to 1860, it would appear that more than 85 per cent. of all the deaths were of children under

* See Boston Medical and Surgical Journal, 1858.
† See Transactions of New York State Medical Society, pp. 182-5, 1859.
‡ See Chicago Medical Examiner, Vol. I. 1860, p. 194.
‖ See Transactions of College of Physicians of Philadelphia, Third Series, Vol. V. p. 38, 1881. Also Report of Dr. John F. Nagle, of New York, in National Board of Health Bulletin, for Nov. 12, 1881, Vol 3, No. 20.

the age of fifteen years.* It is probable that seventy-five per cent. of all the cases of diphtheria occur in children under twelve years of age. And as one attack of the disease does not destroy the susceptibility of the system to subsequent ones, there must be something in the conditions of childhood that acts the part of a predisposing influence.

While isolated cases of diphtheria occur in particular houses or circumscribed localities at all seasons of the year, and epidemics have occurred in all varieties of climate, yet it remains true that the disease, especially in epidemic forms, prevails much the most frequent and severe within the temperate zone, and during the spring and autumn months, when atmospheric conditions are most variable. That overcrowding of the population, as in the tenement houses in our cities, with neglect of ventilation, and the accumulation of vegetable and animal matters from want of sewerage and cleanliness, act as strongly predisposing influences, is abundantly shown by the behavior of the disease in all our large cities during its special periods of prevalence from 1856 to 1860, from 1864 to 1867, and from 1875 to the present time. For instance, in New York city, during the three months ending September 30th, 1881, the whole number of deaths from diphtheria was 545; of which 405 took place in tenement houses, leaving 140 to occur in all other dwellings. During the last five months of the year 1877, there were reported to the health officer of this city (Chicago), 162 deaths from diphtheria, occurring in 122 dwellings. The health officer caused each of these houses to be very thoroughly examined by an expert plumber and sewer builder, whose report showed 13 of these houses to be in excellent sanitary condition in every respect; 14 faulty from insufficient ventilation only; 19 from insufficient ventilation and uncleanliness; 24 from insufficient ventilation and uncleanliness, both of persons and premises; and 52 from defective sewerage and plumbing†.

Facts of similar import may be gathered in connection with the prevalence of the disease in all large cities; and they justify the conclusion that in such aggregations of population, those persons and families who live in poorly ventilated, uncleanly, and imperfectly sewered houses and premises, yield a larger proportion of victims of diphtheria, than those in better sanitary surroundings. But, as I have already pointed out to you in previous lectures, this conclusion is equally, or even more applicable to the prevalence of typhoid, typhus, and all other acute general febrile affections of kindred type. And, consequently, the only legitimate deduction from the facts, is, that the diminished power of vital resistance from impaired tone of health caused by living in bad sanitary conditions, causes a more ready yielding to the influence of the essential cause or causes of diphtheria.

On the other hand, in villages and country districts, the disease has prevailed in its epidemic form with as much severity and fatality, in proportion to the population, as in the most densely populated cities; and in such districts it has shown little or no preference for the poor or uncleanly, but has invaded dwellings kept in the most perfect sanitary condition, and rural districts usually deemed most healthy. For instance, Dr. William C. Wey, of Elmira, N. Y., after carefully noting the rise, progress and decline of an unusual prevalence of diphtheria in that place during the years 1877–78–79–80, says: "In the epidemic which has so severely visited Elmira, the questions of filth and water-supply from unclean sources, as means of inducing and spreading the disease, have been carefully considered. In some cases the water-supply has been found corrupted; in many

*See Reynold's System of Medicine, Am. Edition, Vol. I, p. 62.
†See Report of Department of Health of the City of Chicago, 1876–7, p. 15.

the general surroundings have been unsanitary, and the facilities and comforts of the sick and attendants limited and unsatisfactory. As a matter of course, great mortality has followed in the train of neglect and poverty. In other cases the water supply has come from pure sources, the sanitary conditions of the people and their manner of living have been faultless, the utmost watchfulness has been exercised to maintain rigid non-intercourse with seats of the disease, and yet, in spite of care, and as if in defiance of it, the affection has appeared with as much malignity as in places of human crowding and disregard of hygienic precautions."*

These are the statements of one of the most experienced and intelligent practitioners in that State. To precisely the same import are the facts given by Dr. N. B. Bailey, of Brewster, Putnam County, N. Y., in an account of an epidemic of diphtheria that prevailed in that place during the years 1877–78, published in the same volume of Transactions from which I have just quoted. My own personal observations lead to the same conclusions. I have met with the disease here, in this city, in all grades of severity, among both rich and poor, in the stateliest mansions of luxury, and in the most narrow, dark, damp and uncleanly hovels of poverty and vice. It has visited, from time to time, almost every county in this and neighboring States, and has proved as malignant and fatal, in proportion to the population, on the open plains, and thinly populated, healthy, rural districts in Northern Illinois, Wisconsin, and Minnesota, as in the most unsanitary wards in the city of Chicago. At most, therefore, bad sanitary conditions can only be regarded as predisposing influences, and we must look in other directions for the efficient cause or causes on which the disease depends.

Many of the most eminent observers and writers of the present time represent the essential cause of the disease to be a specific contagium vivum, or organic germ, which has been shown to exist abundantly in the diphtheritic exudation or membrane, and in the epithelial layer of the membrane lining the fauces and other parts affected by the local manifestations of disease. By some, this organic germ is claimed to be the "Oidium Albicans," a fungus, consisting of sporules or micrococci and mycelium.† In 1868 Buhl, Hueter, and Oertel, discovered in the diphtheritic membranous formations, and in the mucous membrane covered by them, various species of bacteria, the most important of which were an exceedingly minute spherical variety, called by Cohn, micrococcus, and the bacteria termo, or rod-shaped bacteria.‡ By Oertel, and many others, these minute organisms are regarded as the essential cause of the diphtheritic disease, and they claim to have produced well characterized diphtheria in animals by inoculation with portions of the membrane from the fauces.

On the other hand, the results of the experiments of Burden-Sanderson, with filtered liquids; the failure of Trousseau and Peter, to induce the disease in themselves by the very free application of the membranous substance to their own fauces; and the entire failure of Curtis and Satterthwaite, and H. C. Wood and Formad, to induce the disease in animals by repeated and carefully executed inoculations with diphtheritic matter, go far to disprove the conclusions of Oertel and his followers. And if we add to these the further fact that every variety of germs found either in the membranous exudations of diphtheria, or in the blood and tissues of diphtheritic patients, have also been found in the miguet or curdy exuda-

* See Transactions of the New York State Medical Society for 1881, p. 243.
† See Clinical Lecture by Dr. Laycock, of Edinburgh, in 1858.
‡ See Cyclopædia of the Practice of Medicine, by Ziemssen, Vol. I, p. 588.

tions upon the mucous membrane of the mouth and fauces in young children, in the white exudations upon the tonsils and fauces in the last stage of consumption and other wasting diseases, and in the exudations that sometimes appear on different parts of the mucous membrane in typhoid, typhus, and other low forms of fever, we shall find it much more in accordance with sound principles of reasoning to conclude that these minute organic forms, called bacteria, micrococci, etc., are simply accompaniments, if not products, of certain degenerative organic processes that take place, to a greater or less extent, in all the acute febrile and inflammatory affections of an asthenic type. If we adhere impartially to well ascertained facts, we must admit that diphtheria often makes its appearance in families, asylums, and schools, as well as at the beginning of epidemics, under such circumstances that it is impossible to trace it to any form of communication with previous cases, either in the same localities or elsewhere. In other words, it is capable of spontaneous development, and consequently does not depend for its production and spread upon any specific contagious germs or virus generated in the bodies of the sick. I have seen many cases illustrative of this fact; and the same is strikingly exemplified by the outbreak of the disease in Brewster, N. Y., as described by Dr. Bayley, in 1878.*

The same adherence to simple facts, however, compels us to admit that in very many cases the disease appears to spread by an infection capable of contaminating clothes and furniture, and of being carried by them from family to family, and from one locality to another. Oertel recognizes both these series of facts, and claims that when it develops spontaneously, it is from some organic *miasm;* and hence he includes diphtheria in his class of "miasmatic contagious diseases." The fact that this disease usually prevails as an epidemic, commencing often without any traceable communication with previous cases or known contagious influence, and attacking, simultaneously, members of families in different parts of a city, village, or rural district, who have neither had any communication with each other nor with any known common source of infection, would indicate that its essential cause consists in some special condition of the atmosphere, which the older writers called an epidemic constitution. Its nature will remain unknown until more systematic and continuous observations are made and recorded, concerning all appreciable conditions of the atmosphere in direct connection with records of the prevalence of acute general diseases. When this is done through a series of years, with the accuracy now attainable by the aid of physics, chemistry, and microscopy, we shall have such elements for comparison as will throw light upon this and many other obscure questions connected with the etiology of diseases.

Symptoms.—For the clinical study of diphtheria I shall group the various cases met with, under three heads—namely: the simple, the croupous, and malignant. In the first group I shall include all the cases that present so moderate a degree of severity as to pass through their successive stages with a natural tendency to convalescence. In the second group I shall include all those cases in which the local inflammation invades the larynx and trachea. In the third group will be included all such cases as by the gravity of the general morbid conditions, or the severity of the

* See Transactions of the New York State Medical Society for 1881, p. 345.—Dr. Bayley says: "In twenty-one of the fifty cases of which I have notes, the disease was developed without any known previous exposure; and especial pains were taken to arrive at the truth. In seven of these cases there could be no mistake, as they were the primary ones, and no members of these families (three in number) had been exposed to any sore throat whatever. Moreover, these seven fell ill on the same days, viz.: December 2d, 3d, and 4th; and at two different points, separated by a distance of 3,218 kilometers (nearly three miles); and, further, the families moved in very different spheres, and did not come in contact with each other in any manner."

naso-pharyngeal and glandular inflammations tend strongly towards a fatal result. The majority of cases of simple diphtheria are developed gradually; the patient feeling for one, two, or three days a gradually increasing sense of weariness; indisposition to mental or physical activity; vague or ill-defined pains in the head, back, and limbs; with indifference to food. Then the face becomes a little flushed, the lips dry, the expression of countenance dull, the pulse moderately accelerated, with an increase of one or two degrees of temperature, and a more decided sense of weakness; and, in addition to these symptoms of a moderate general fever, there is observable a little undue fullness behind and beneath the angle of the jaw, with some feeling of stiffness and soreness in swallowing. On examining the fauces at this stage you will find the mucous membrane covering the tonsils, arch of the palate, and portions of the pharynx, presenting a tumefied and dark red appearance, with some spots of white, or yellowing white, membranous exudation closely adhering to it, together with some degree of swelling of the tonsils and neighboring lymphatic glands.

In a smaller number of the cases belonging to this group, the attack is more abrupt, and accompanied by chilliness or even a decided chill, followed by a more active general fever, but the same local symptoms as I just described. The symptoms thus begun usually gradually increase during the succeeding three or four days. The patches of membrane on the inflamed surface of the fauces increase in number and size, until in many cases they coalesce and cover nearly the whole surface, and extend with the inflammation into the posterior nares. During the same time the tonsils and lymphatic glands also increase in size, impeding the free opening of the mouth, and rendering deglutition more difficult. The fauces also become troubled with an excess of tenacious mucus, which in young children often causes much rattling in the throat and some cough. The urinary secretion is moderately diminished, and in a small proportion of cases contains some albumen, and the bowels usually remain quiet unless disturbed by laxative medicine.

This class of cases usually reach the climax of activity in both general and local symptoms in from three to five days after the first development of local symptoms. The swelling of the glands of the neck and parts within the fauces ceases to increase; the membranous exudation soon appears more yellow and shows signs of loosening or disintegration; the saliva or mucus in the mouth and fauces becomes more opaque, more easily dislodged, the breath more offensive, and generally some discharge from the nostrils. While these local changes are taking place, the general febrile symptoms also diminish ; and in the mildest variety of cases by the end of the first week, the temperature has returned to the natural standard, the pulse becomes soft and weak, but natural in frequency; the cutaneous and urinary secretions natural, and the membranous exudation and swelling both in the fauces and lymphatic glands disappear, leaving the patient fairly convalescent, yet much debilitated. In the more severe cases belonging to the first group, the morbid phenomena reach their climax in the same length of time, and the same subsequent changes take place, but the subsidence of the glandular swellings and the disintegration of the membranous exudations progress slower, and are accompanied by more copious and troublesome discharges from the mouth and nostrils, and greater offensiveness of the breath. The patient also exhibits more dullness, with paroxysms of restlessness, especially when the fauces and nostrils become obstructed by the mucous or muco-purulent discharge, as is apt to be the case in infants and young children. The pulse becomes more weak, the bodily temperature returns more slowly to the natural standard, although the skin

and extremities may even feel unduly cold, and the patient is longer troubled with difficulty of deglutition, and more tendency of food and drink to regurgitate through the nostrils. Yet, in nearly all of these cases the disease completes its course, and convalescence is established by the middle or latter part of the second week. In some, however, the breaking up and disappearance of the false membrane is accompanied and followed by superficial ulcerations in the tonsils and other parts of the throat; and, in a smaller number, one or more of the inflamed lymphatic glands suppurate, forming abscesses in the neck. These occurrences may postpone the establishment of convalescence until some time during the third week from the commencement of the attack.

The second or croupous group of cases, including all those in which the diphtheritic inflammation invades the larynx, will be presented to you under two aspects: one, in which the inflammation enters the larynx apparently by extension from the pharynx, and generally manifests itself first between the fourth and seventh days after the commencement of the disease, or even after convalescence has fairly commenced; the other, in which the inflammation attacks the larnyx primarily, giving rise to hoarseness of voice, stridulous breathing and croupal cough, from the beginning of the patient's sickness. In both, the general symptoms are the same as in ordinary diphtheria.

In all the cases in which the local disease develops in the larynx by extension from above downward, and does not commence until several days after the beginning of the general diphtheritic disease, there can be no difficulty in making the diagnosis. But when the larynx is invaded coincidently with the beginning of the sickness, there is often much difficulty in keeping a clear line of distinction between the diphtheritic disease and the ordinary sporadic pseudo-membranous laryngitis. And many writers of the present day regard them as identical, and do not attempt to distinguish the one from the other. In all the cases that have come under my observation, however, the diphtheritic laryngitis has been accompanied by some redness and swelling of the tonsils and other glands in the neck; a soft, weak pulse; more dullness of expression, and earlier symptoms of exhaustion. In all these cases the inflammation in the larynx is accompanied by a rapidly increasing exudation, which solidifies into a thick, firm layer of false membrane over all the interior of the larynx, the cartilages at the opening of the glottis, and often downward through the treachea and into the larger bronchial tubes. The voice becomes early suppressed, the cough rough, stridulous and suffocative; the breathing difficult, and accompanied by a tight, wheezing sound in the neck at first, but subsequently accompanied by mucous rattle. To these local symptoms of direct obstruction in the larynx, there is added a soft, quick, weak pulse, somewhat purplish or leaden color of the lips, and fullness or bloating of the face; coolness of the extremities, with moderate increase of temperature in the head and trunk of the body; drowsiness, with temporary paroxysms of restlessness and tossing; often difficulty of deglutition, and scantiness of urine. In very severe cases the dyspnœa and rattling in the throat and larynx increases every hour, with frequent paroxysms of choking, strangling cough, during which, more or less of a thick, ropy mucus is forced out, containing shreds of the false membrane; after which, for a brief time, the breathing is easier. But the obstruction soon accumulates again, causing the sense of suffocation and struggling for breath to be renewed, until the imperfect oxygenation and decarbonization of the blood renders it no longer capable of sustaining the sensibility of the brain and nervous centers, when the patient becomes somnolent or stupid, the

breathing frequent, very difficult, and accompanied by coarse mucous rattling in the air passages; blueness of the lips; coldness and blueness of the extremities; a small and very weak pulse; and, finally, relaxation of the sphincters, a general clammy sweat, and death from asphyxia. The fatal result is reached in some of these cases in five or six hours; in a much larger number, however, it is deferred from two to five days. If the tumefaction of the parts within the larnyx and the membranous formations are not sufficient to destroy life in from three to five days, the latter begin to loosen and disintegrate, and in the paroxysms of coughing more shreds and patches of the membrane are dislodged and thrown out with a more opaque, muco-purulent expectoration.

The tightness and constriction in the breathing diminishes; the color of the skin and expression of countenance improve; the pulse becomes slower; the mind more active; and in three days, or from seven to nine from the commencement of the laryngeal trouble, all bad symptoms have disappeared, leaving the patient convalescent but much debilitated. In some cases of diphtheritic laryngitis, the membrane is detached and thrown out, in the severe paroxysms of coughing, in large pieces, presenting, when inflated, more or less of a complete model of the interior of the larynx. Many years since I saw a case in consultation with my colleague, Dr. Hollister, in which the patient, a boy aged seven years, in a violent paroxysm of coughing expelled a perfect tubular cast of the larynx and trachea, measuring seven inches in length to the bifurcation, and extending beyond to the primary division of the bronchial tubes, having thirteen divisions on one side and eleven on the other.* The expulsion was followed by a great degree of immediate relief; but, as frequently happens, the relief was only temporary. Fresh exudations took place on the inflamed membrane, and, extending lower into the bronchial tubes, renewed the dyspnœa, and proved fatal before the end of the next twenty-four hours.

In the third, or malignant group of cases, the onset of the attack is generally abrupt, and attended by appearances of a chill or cold stage, which is followed by a more rapid rise of temperature of the body; a more rapid development of inflammation and swelling, both in the fauces and glands of the neck, often causing in a very few hours great difficulty of deglutition, inability to open the mouth widely, and the speedy formation of a thick, tough, yellowish membrane over the whole arch of the palate, tonsils, and pharynx. The pulse is frequent, soft, and weak; breathing noisy from the existence of tenacious mucus in the throat and nostrils, and more frequent than natural; the expression of countenance dull, with a dark or purplish flush; extremities often cool, with leaden color under the nails; urine seanty, and often containing some albumen; and the mind inclined to drowsiness, except in momentary paroxysms of restless tossing or of efforts to clear the mucus from the throat. Sometimes the attacks of this variety are so severe, and the tumefaction of the tissues within and behind the angle of the jaw so great, that the blood is obstructed in its return from the brain, causiug stupor, inability to swallow, extreme frequency and feebleness of pulse, and death in from twelve to eighteen hours after the beginning of the attack. In other cases, the obstruction to the cerebral circulation is less, and life is prolonged from one to five days. In such, during the second day, the inflammation and exudation extend into the nostrils posteriorly, and sometimes into the eustachian tubes, and even into the middle ear. During the third and fourth days the false membranes begin to disintegrate, the mucus in the fauces and nostrils becomes more abundant, more opaque or muco-purulent, decidedly offensive, and

*See Chicago Medical Examiner, Vol. I, pp. 95-6, 1860.

gives occasion to much noise and difficulty of breathing. The inflamed mucous membrane also shows commencing ulceration, and in many cases gangrene. The patient loses strength rapidly, and usually dies from complete exhaustion before the end of the fifth day.

I have now given you a summary of the more important symptoms of the different grades of diphtheria. You observe that it is a disease varying greatly in its degree of severity in different seasons, and in different cases the same season. So true is this, that I have in some years attended a large number of cases with less than two per cent. of deaths; while in other years, with no greater numbers, the proportion of croupal and malignant cases was so great that the deaths averaged from ten to fifteen per cent. It is not rare that, in the more severe epidemics of this disease, all the children in a family are destroyed within a few days. I remember being called to visit, in consultation, a Scandinavian family in the northwest part of the city, where I found three children lying side by side on the same table, dressed for burial, and a fourth one dying, leaving only the nursing infant in its mother's arms.

Thus far I have spoken of the diphtheritic membranous exudations as appearing only in the throat and parts in immediate connection with it. The same, however, may attack the vagina and vulva, the lips, the wing of the nose, the conjunctiva of the eye, and any sore or raw surface in any part of the body. I saw one well marked case, in which a thick layer of false membrane covered one-third of the upper lip, accompanied by considerable tumefaction; and another in which a lady, recovering from an extirpation of a cancerous tumor from one breast, while there was still a healthy granulating surface unhealed, was attacked with the ordinary general symptoms of diphtheria, accompanied with a moderate degree of inflammation and exudation in the fauces. Simultaneous with the appearance of the latter, the uncicatrized surface on the breast became completely covered with a thick layer of false membrane, which remained about three days, and as it disintegrated and disappeared, it was accompanied by an abundant sero-purulent and offensive discharge, with a complete destruction of all the previously healthy granulations. After the diphtheritic disease had disappeared, the raw surface on the breast gradually resumed a healthy appearance, and subsequently progressed to complete cicatrization.

Diagnosis.—From catarrhal sore throat, diphtheria is distinguished by the character of the general fever; the coincident inflammation of the mucous membrane of the fauces and tonsils, with tumefaction of some of the lymphatic glands near the angle of the jaws; and still more, by the appearance of more or less diphtheritic exudation on some part of the inflamed structures. The diagnostic differences between diphtheria and ordinary sporadic croup or active pseudo-membranous laryngitis, I pointed out when giving the symptoms of the croupous variety of diphtheria, and need not repeat them. From scarlet fever, diphtheria is distinguished by the much less sudden and severe onset of the fever, the presence of diphtheritic membranous exudations, and the absence, generally, of any exanthematous eruption upon the skin. In some epidemics of diphtheria quite a proportion of the cases will be accompanied by a moderate amount of a fine red exanthematous rash, causing the surface to much resemble mild cases of scarlet fever. But the milder grade of general fever, and the coincident existence of white patches of diphtheritic membrane in the fauces, will usually enable the practitioner to keep the diagnosis correct. It has undoubtedly happened, however, when both these general febrile diseases were prevailing in the same community, that they have manifested

a disposition to commingle the characteristic symptoms of both in the same patient, thereby causing doubt and sometimes controversy concerning the diagnosis. It is more proper to regard such cases as presenting the combined or simultaneous presence of the causes of both diseases, in the same manner as we recognize the coincident action of the causes of typhoid and periodical fevers, producing what has been styled typho-malarial disease.

Prognosis.—The prognosis has been pretty fully indicated by the clinical history I have just detailed to you. All the milder cases tend towards spontaneous recovery in from seven to fourteen days. The more malignant and the croupous groups of cases manifest a strong tendency to end in the death of the patient, and are always productive of a high ratio of mortality.

Pathology.—I regard diphtheria as a general febrile affection, arising from some cause or combination of causes by which the properties of the blood and of the organized structures are so changed as to render the fibrin more disposed to solidify or coagulate than natural, and to lessen the tone and contractibility of the muscular structures, with special tendency to develop asthenic inflammation of greater or less severity in the mucous membrane of the throat and adjacent lymphatic glands. That the general disease is one of a typhoid or adynamic character, and the local inflammations asthenic, is proved by the generally soft, compressible pulse, universal muscular weakness, liability to syncope from moderate exertion, and the aplastic character of all exudations. By the latter I mean the uniform tendency of all the membranous exudations, however thick or tough they may be, to undergo degeneration and dissolution, never taking on permanent organization or becoming a bond of union by adhesively uniting surfaces that may be in contact with each other. This view is further corroborated by the frequent occurrence of muscular paralysis as a sequel of the disease.

Treatment.—From these views of the pathology of diphtheria I deduce four well defined, rational indications to be fulfilled by treatment: First, to arrest the further infection and deterioration of the blood. Second, to improve the general tonicity of the tissues by increasing the vital affinity. Third, to sustain the nutritive and excretory functions as near their natural condition as possible. Fourth, to mitigate the violence of such local inflammations as may exist in each individual case. To fulfil the first of these indications, the chief reliance has been placed on the internal use of chlorine, bromine, iodine, and their salts, such as the chlorates of potassium and sodium; and to these have been added more recently, the sulphurous acid and the sulphites of sodium and calcium,the benzoate of sodium, the sulpho-carbolate of sodium, and the permanganate of potassium. Of these, I think the aqueous solution of iodine, the chlorate of potassium and the benzoate of sodium are the most important. To fulfill the second indications, I rely principally upon a judicious use of quinia, iron, strychnia, pure air and nourishment; even when temporary stimulants are needed, carbonate of ammonium and camphor are the most reliable. Many recommend strongly the use of some one of the alcoholic class of drinks, and mention the extraordinarily large doses borne by diphtheritic patients without intoxicating effects. So far is this from affording a reason for their use, that I should construe it in the opposite direction. Both the general susceptibility of the tissues and the sensibility of the nervous system are blunted or below the normal standard, and consequently, anæsthetics like alcohol, are neither indicated nor readily responded to when given. The same principle or therapeutic rule applies here, that I explained more fully when speaking to you in relation to the treatment of typhoid fever.

If you can succeed well in fulfilling the first and second indications as now explained, the fulfilment of the third follows as a necessary result. Yet, when called early, and you find the skin hot and dry; urine scanty; tongue coated; and bowels inactive, you can give a small alterative dose of calomel with bicarbonate of sodium, every three or four hours, until three doses are taken; and if the bowels do not move in three hours after the third dose, give a mild laxative, and it will generally produce a favorable effect. The action of the skin and kidneys may be further sustained by suitable doses of spirits of nitrous ether and liquor ammonii acetatis. To fulfill the fourth indication, namely—to lessen the severity of the local inflammation in the fauces, air passages, and glands of the neck, a great variety of local applications have been used. During the severe epidemics in this country, occurring between 1856 and 1864, nitrate of silver in all gradations of strength, from the solid stick to a solution of 0.33 grams (gr. v.) to 30.0 cubic centimeters (fl. ℥i.) of water, was extensively and perseveringly used locally, with the expectation of arresting the membranous exudation and of limiting the extent of the inflammation. After an abundant experience, its use was abandoned by nearly all the more accurate observers as either useless or positively injurious. Applications of strong solutions of sulphate of copper, tincture of iodine, and tincture of the chloride of iron, were tried with no better results, and the profession generally had come to regard local applications of any kind as a matter of secondary importance, until Oertel and others again promulgated the doctrine that diphtheria is primarily a local disease, produced by the direct action of bacterial germs on the mucous membrane of the fauces and air passages, and through which they entered the blood, and secondarily, produced general infectious fever. Under this teaching the early and thorough local application, not of caustics, but of strong antiseptics or germicides, as carbolic, salicylic, benzoic, and sulphurous acids, were brought prominently to the notice of the profession, and received the unqualified commendation of many practitioners. During the past ten or twelve years diphtheria has prevailed with average severity in most of our large cities and in many country districts, affording abundant opportunities for testing the virtues of this class of remedies. And, aided by the coincident extravagant ideas in regard to the uses of antiseptics in the practice of medicine and surgery generally, they were enthusiastically applied in every form, and every degree of strength; in solution, with the swab and the syringe; in spray, with the atomizers; and in vapor, by inhalations. As might be expected, the results, as reported at the various medical society meetings and through the medical press, have been varied. As a general rule, those who met the disease in a mild form reported great success. Those who met the disease in its more severe and malignant aspects, reported the usual ratio of mortality, and pronounced the germicide treatment useless. A middle class of practitioners, like a member of the Illinois State Society, reported, with enthusiasm, that the thorough application of pretty strong solutions of carbolic acid had aborted every case that had come under his treatment *before* the inflammation and exudation had entered the posterior nares or the larynx. But unfortunately the disease had extended beyond these limits in so many cases before coming under treatment, that the actual ratio of mortality to the whole number of cases treated, was the same as usual.

So, gentlemen, if you will diligently examine the statistics of cases and mortality in all the cities and municipalities in which such statistics have been kept, for the past ten years, in which germicidal theories and practice have predominated, with the same class of statistics for the preceding

ten years, you will find no evidence that such practice has resulted in diminishing, in any degree, the ratio of mortality below that of the former decade. Having already stated to you that I regard diphtheria as primarily a general febrile affection, developing certain local inflammations of peculiar character during its progress, and having now explained the several objects to be accomplished in its treatment, it only remains for me to indicate more definitely which of the remedies mentioned for the several purposes I deem best, and their mode of use as adapted to the several stages of the disease. In the milder cases of simple diphtheria, very little medication is either necessary or proper. For such, I direct a diet of milk and farinaceous articles, rest, as fresh good air as possible, a moderate, comfortable temperature of the room, and the following prescription for medicine:

℞			
	Potassii Chlorate	10.0 grams.	ʒiiss
	Acidi Muriatici	4.0 c. c.	ʒi
	Tincturæ Belladonnæ	10.0 c. c.	ʒiiss
	Aquæ	260.0 c. c.	℥viii

Mix. Give from two cubic centimeters (fl. ʒss.) to eight (fl. ʒii), or from half a teaspoonful to a dessert spoonful, according to the age of the patient, every two or three hours, without further dilution. The application of this solution to the fauces and throat, is made much more complete and easy by swallowing it, than by any process of swabbing, sponging or gargling; while its introduction into the system constitutes one of the best means for fulfilling the first indication for general treatment. The solution of the chlorate of potassium with the mineral acid, combines the properties of an efficient antiseptic and tonic, while the influence of the belladonna on the vessels of the mucous membrane and glands of the throat and neck tends to lessen both tumefaction and membranous exudation.

During the last thirty years I have treated very many cases of mild diphtheria, without any other medication than the use of the formula just given. If, at any time during its use, the effects of the belladonna accumulate sufficient to perceptibly dilate the pupils, the dose should either be diminished or given at longer intervals. In cases of greater severity, yet not positively malignant, I give the same formula in the same manner during the first three days after the commencement of the disease. If the patient has been previously healthy and well nourished, and the pulse and temperature rise pretty actively, with scantiness of secretions, I give in addition during the first day, an alterative dose of calomel at intervals of once in two or three hours until three doses have been taken; and, if necessary, follow them by a mild laxative or warm water enema. After the bowels have moved, I direct a solution of iodine 0.33 grams (gr. v.) and iodide of potassium 2.0 grams (gr. xxx.) in 45 cubic centimetres (℥jss) of water, to be given in doses suited to the age of the patient, every six hours. During the same early stage, if the tonsils and glands behind and below the angle of the jaw commence to swell actively, I keep the external parts closely covered with cloths wet in an infusion of aconite leaves and chloride of ammonium, 30 grams (℥j) of the former, and 15 grams (ʒss.) of the latter to one litre (Ojj) of boiling water. When, from any cause it may be difficult to keep the wet cloths applied properly, the following liniment may be used instead:

℞			
	Olei Olivæ	90.0 c. c.	℥iii.
	Olei Terebinthinæ	15.0 c. c.	℥ss.
	Chloroformi	15.0 c. c.	℥ss.

Mix, and apply to all the external swollen parts every three hours, or often enough to keep the surface moist. If, under the remedial agents I have now mentioned the case progresses favorably, and when the time for the membranous exudations to begin to loosen and disintegrate comes, which is generally from the third to the fifth day, the breath and saliva do not become offensive, and the swelling of the glands does not increase further, there need be no essential change in the treatment except to lessen the frequency of doses as the disease declines, and an early convalescence will be reached. But if, at the stage just mentioned, the breath becomes offensive, the saliva more abundant, and mixed with more or less muco-purulent or sanious discharge from the throat and nostrils, with more dullness of expression and a softer pulse, I immediately exchange the chlorate of potassium and belladonna solution for the tincture of chloride of iron and quinine, given in moderate, but frequently repeated doses, and require more diligence in giving nourishment. The solution of iodine may generally be given with benefit two or three days longer. Under the influence of the quinine, iron, and simple nourishment, the patient will pass the crisis of the disease with only a moderate amount of ulceration and suppurative action in the inflamed membranes, and the general febrile symptoms will gradually decline until convalescence is established. In some of the more severe and malignant cases, the crisis of the disease is marked by great weakness, a more copious flow of offensive muco-purulent matter from the mouth and nostrils, and more extensive destruction of the inflamed structures by ulceration, and sometimes by gangrene. In such cases, I continue the use of the quinine and iron, and, in addition, give carbonate of ammonium and camphor, in moderate but frequently repeated doses, and add to what nourishment is taken by the mouth, the use of nutritive enemas. Unfortunately, in many of these bad cases, deglutition is so impaired that neither medicines nor nourishment can be swallowed in sufficient quantity to effect the needed support. Even in such, much can be done to sustain them until the throat begins to improve, by a judicious use of milk, beef tea, and other items of nourishment in the form of enemas, and most of the medicines required can be added to the enemas. Further support may also be given by inunction of cod-liver oil, in which may be suspended a small amount of strychnine. To a litre (Oii.) of cod-liver oil may be added 0.2 grams (gr. iii) of strychnine. This may be well shaken and applied sufficient to anoint nearly the whole surface of the body three times a day. In the cases that present a strongly malignant aspect from the beginning, I give the quinine and tincture of chloride of iron, alternated with the carbonate of ammonium and camphor at once; and during the first twenty-four hours apply freely over the trunk of the body the cod-liver oil, holding in solution a small proportion of iodine; and, after the first day, the strychnine my be added in the proportion already stated.

During the last few years, I have used a solution of the benzoate of sodium as a substitute for the chlorate of potassium, and belladonna solution, in the early stage of the disease. Ten grams (ʒiiss.) may be dissolved in 120 cubic centimetres (fl. ʒiv) of water; of which four cubic centimetres, or one teaspoonful may be given to an adult every two hours. It appears to exercise much influence in limiting the amount of the membranous exudation, and is particularly well adapted to the early stage of the more active sthenic class of cases. Again, in the second stage of the disease, if the muco-purulent discharge from the nostrils becomes copious and offensive, or irritating to the parts with which it comes in contact, it will do good to have the nostrils syringed out freely at least twice in the twenty-four hours, with a weak solution of carbolic acid and sulphate of

zinc or of permanganate of potassium. If an anodyne is required at night to aid in procuring rest, I know of none better than a powder containing the compound powder of opium and ipecac, 0.33 grams (gr. v) and pulverized gum camphor 0.13 grams (gr. ii.) for an adult, and proportionably less for children.

I have now given you an outline of that course of treatment of the several stages and grades of severity of this disease, which has been, in my hands, the most beneficial to my patients, leading to the highest ratio of recoveries and leaving the smallest ratio of important sequelæ. One variety of cases, however, has been omitted from this outline, namely, the croupous or laryngo-tracheal. When the diphtheritic inflammation invades the larynx, whether primarily, with the beginning of the attack, or secondarily, by extension from the pharynx, I give, as early as possible, an emetic dose of the sub-sulphate of mercury, and repeat it at intervals of from two to six hours, until the stage of increasing exudation has passed. Thirteen centigrams (gr. ii.) of the sub-sulphate given in the form of powder, will generally produce prompt and free vomiting in children from three to five years of age. For older patients the dose should be increased, and for younger ones diminished. In the interval between the emetics, I give during the first twelve hours, a small dose of calomel and bicarbonate of sodium every two hours. To children from three to five years old, six centigrams (gr. i.) of calomel and twelve centigrams (gr. ii.) of the sodium, may be given at a dose. During the same period of time, a solution of lactic acid, 0.33 cubic centimetres (min. v.) to 30. c.c. (fl. ʒi.) of water should be frequently thrown into the fauces in the form of spray from an atomizer, and the liniment I have previously mentioned, containing oil of olive, oil of turpentine and chloroform, applied freely to the front and lateral parts of the neck externally. After the first four or five doses of the calomel and sodium have been given, they are omitted, and I give, instead, a solution of lactate of iron, 4 grams (ʒi.) to 120 cubic centimetres of water (fl. ʒiv.) of water, of which 2 c.c. (fl. ʒss.) or half a teaspoonful, may be given every two hours. If the invasion of the larynx has been secondary, several days after the commencement of the general disease, I omit the calomel and sodium powders, and commence the use of the solution of the lactate of iron, alternated with quinine, at once. In all other respects their management is the same as I have just indicated.

Sometimes a mild anodyne and expectorant influence is needed to lessen the violent spasmodic quality of the cough and aid in promoting rest—especially in the later stages of the disease. For such purpose I know of nothing better than an equal mixture of the compound syrup of squills and camphorated tincture of opium, given in doses suited to the age of the patient. If a judicious use of the remedies I have just detailed should fail to relieve the patient, and suffocation be impending, the only alternative is a resort to tracheotomy, which almost always affords a surprising degree of temporary relief, but is very generally followed by an extension of the inflammation into the bronchial tubes and the ultimate death of the patient. During all the treatment of the croupous cases the temperature of the room should be kept a little above the usual standard of healthy comfort, and the air constantly impregnated with aqueous vapor. Some place much reliance on the inhalation of the vapor of hot water, in which quicklime is undergoing the process of slacking. I have seen it perseveringly tried many times, but with very little effect. I regard it of far less importance than the lactic acid spray, and even less beneficial than the old-fashioned remedy, consisting of the free inhalation of the vapor from a hot infusion of hops in vinegar.

Convalescence.—Due attention should be given to the management of the period of convalescence from all grades of diphtheria. To secure a proper action of the skin and kidneys, and promote the renewal of a healthy tone and sensibility in the muscular and nervous structures, the patient should be kept much at rest; well protected from sudden atmospheric changes by flannel underclothes; judiciously supplied with fresh, dry air, and plain, nutritious, and easily-digestible food. In the convalescence from severe cases, the taking of a small dose of strychnine or nux vomica, with a soluble salt of iron at each regular meal-time, will be of much benefit, both in hastening the return of strength and in lessening the risk of paralysis.

Prophylaxis.—The best means of preventing the spread of diphtheria is to isolate, as far as practicable, all cases as they occur, and maintain essentially the same sanitary regulations as I mentioned for the prevention of typhus and typhoid fevers.

Sequelæ.—Congestion of the cortical texture of the kidneys, and general dropsy occasionally occur as a sequel of diphtheria, though much less frequently than after scarlet fever. For the treatment of such cases I refer you directly to the lecture on the sequelæ of the fever just named. The most frequent and troublesome of the affections that are liable to arise during the convalescence from diphtheria is some form of paralysis. In most cases it is limited to the muscles of the fauces and pharynx, and is only sufficient to simply give the voice a decided nasal quality, and make deglutition a little difficult; but is sometimes so complete as to render swallowing altogether impossible. During the prevalence of the disease in this city in 1858–9, I saw a case of this kind with the late Dr. J. A. Collins. The patient was a boy about eight years of age; and it was necessary to feed him liquid nourishment through a stomach-tube for two weeks, before he regained the power to swallow anything.

While the paralysis more frequently attacks the muscles of the fauces and throat, it may manifest itself in any one or more of the voluntary muscles in any part of the body and extremities. Or it may attack one set of muscles after another, until, like rheumatism, it has passed in succession over a large proportion of the voluntary muscles of the system. A case of this kind was brought to the Mercy Hospital two years since. It was in the person of a young man who had passed through a moderately severe attack of diphtheria, and recovered so far that he had begun light out-door work.

He first lost the power of speech and deglutition. In a few days these functions began to improve, when he lost all voluntary motion of the muscles of one side of his face and eye. Just as he was regaining control over these, the paralysis involved the muscles of both upper and lower extremities, and was so near complete that he could neither feed himself nor stand on his feet. It was at this stage of his disease that he was brought into the hospital. The paralysis following diphtheria, whether partial or complete, appears to be a simple loss of nervous force or muscular contractility, and is not accompanied by any inflammatory or febrile symptoms, or even local pain and soreness. It very generally tends towards recovery, and probably never ends fatally, except in very rare instances, when it attacks the muscles of respiration or of the heart. No case has terminated fatally or failed to recover, within the circle of my own practice. The only remedies necessary are rest, good air, nutritious and easily-digestible food, and muscular and nerve tonics.

Of the latter, we have none better adapted to these cases or more promptly curative than strychnine, citrate of iron, and the hypophosphites. To an adult or patient over fifteen years of age, I give a pill or capsule

containing strychnine, two milligrams (gr. 1-30), and citrate of iron, thirteen centigrams (gr. ii), before each meal-time; and four cubic centimeters (fl. ʒi) of either the syrup of the lacto-phosphate of calcium or of the compound syrup of the hypophosphite of sodium, calcium, and iron, half an hour after each meal. Of course, proportionately less doses must be given to younger children.

Under such management the patients usually make a good recovery in from one to four weeks. The daily application of mild currents of electricity or galvanism has also proved beneficial.

LECTURE XX.

Periodical Fevers—Their History, Causes, Varieties, and General Pathology.

GENTLEMEN:—I now invite your attention to the second group or family of acute general diseases, usually styled periodical fevers. The individual fevers included in this group are fewer in number and much more closely allied to each other than those constituting the first division, under the general name of continued fevers. They are really varieties or different grades of one acute general disease, arising from the same efficient cause, prevailing at the same times and places, and readily convertible from one into the other.

History.—The periodical fevers have been known and described, from the earliest records of medicine, under the names of paludal fever, marsh fever, endemic fever, ague, bilious remittent, and periodic fever. They have often, also, been named from the locality or country where they prevail, as the African, Bengal, Mediterranean, Walcheren, Chagres, Panama fever, etc. At the present time they are very generally designated as periodical or malarial fevers. Their prevalence appears to be limited by certain meteorological and topographical conditions, independent of the social or sanitary condition of the people. For instance, a certain degree and duration of summer heat, acting upon a soil containing a sufficient amount of moisture and decomposable vegetable matter, appear to be conditions necessary to the development and spread of these fevers. If you go so far north or south of the equator, or ascend a mountain range so high, that you do not get a mean summer temperature equal to 16.9° C. (60° F.) for two consecutive months, you will find no prevalence of periodical fevers. If there are any exceptions to this rule, they are few and unimportant. On the other hand, if you have the longest and most intense summer heat, without the presence of both moisture and decomposable vegetable matter in the surface and sub-soils, you will find no prevalence of this variety of disease. Consequently, its chief prevalence is within the temperate and tropical zones, and on moist, alluvial, or tertiary formations, at moderate elevations above the level of the sea. In Europe the regions most subject to the prevalence of periodic fevers are the whole western coast of Italy, including Tuscany, the Pontine Marshes, the Campagna of Rome, and the environs of Naples; on the low lands along the southwestern coast of Spain and Portugal; the southern coast of France;

the greater part of European Turkey, including Bulgaria, Albania, etc.; that part of Russia bordering on the Baltic and Black Seas, and in the valleys of the Danube, Dnieper, Don, and Volga rivers; the plains of Hungary, Croatia, and Slavonia; that part of Lower Austria along the Danube; the Baltic coast of Prussia; the western coast of Holland, including the marshy plains on the Rhine and its tributaries; and that part of Sweden bordering on the Baltic and along the river Angermann, as far north as 62° 20′ N. latitude. The latter is said to be the most northern point of its prevalence in Europe. Iceland, Norway, the greater part of Denmark, the British Islands, Switzerland, and all mountainous districts of Central Europe are quite exempt from the prevalence of these fevers. In Asia, the great alluvial valleys of the Indus and the Ganges, the whole south and southwestern coast of China, the coasts of Syria and Asia Minor, on the shores of the Red Sea and Persian Gulf in Arabia, on the islands of Ceylon and Sumatra, and in Farther India, periodical fevers are very prevalent and severe. The same is true in reference to all the western and northern coast of Africa bordering on the Atlantic and Mediterranean, the valley of the Nile in Lower Egypt, and along the banks of the Gambia, Niger, and Senegal Rivers. In America, this variety of fever is endemic, and often severe in many of the islands of the West Indies, and on the low, alluvial lands bordering all sides of the Gulf of Mexico, which includes the northern coast of South America, the eastern coast of the Isthmus, Central America, and Mexico, and the southern coast of the United States, from the mouth of the Rio Grande to Key West. In addition to that part of the Southern States bordering on the Gulf of Mexico, this country presents four principal malarious districts: First, all the low, alluvial lands bordering on the Atlantic from Florida to Rhode Island, in width extending from the foot of the Alleghany Mountains to the seashore. Second, the country bordering on the great interior lakes on our northern border, which includes the northwestern part of New York, the northern border of Ohio, Indiana, Illinois, and the whole peninsula of Michigan. Third, the great interior valley lying between the western foot of the Alleghany Mountains, on the east, and the eastern slope of the Rocky Mountains, on the west, and extending from Lake Superior and the elevated plateau west of that lake, on the north, to the Gulf of Mexico, on the south. The plateau of which I speak, lying west of Lake Superior and Lake of the Woods, is only from 1,500 to 1,800 feet above the level of the ocean; but it constitutes the great hydrographical axis of the continent, separating the waters that flow eastward through the Great Lakes and the St. Lawrence to the Atlantic, from those flowing north to the Arctic Ocean, and those flowing south through the Mississippi to the Gulf of Mexico; and constitutes the northern limit of the prevalence of the malarial fevers. The fourth district embraces the Pacific slope, extending from the foot of the Sierra Nevada Mountains to the coast, and extending from Mexico, on the south, to Alaska, on the north. Besides the extensive districts I have mentioned, there are many smaller valleys along rivers or on the borders of lakes, in almost every State where periodical fevers abound, more or less. The parts of our country most nearly exempt are the hilly and mountainous region extending from the northern part of Georgia and Alabama to the northeast, until it reaches the southwestern part of Maine, embracing the Cumberland, Alleghany, Catskill, and Adirondack ranges of mountains, and the White and Green Mountains of New Hampshire and Vermont; and the great mountain ranges intervening between the western border of the Mississippi valley and the Pacific slope, extending parallel with the Pacific coast from Mexico to the Arctic regions.

This latter immense mountain district, where it is crossed by the Union Pacific Railroad, is made up of four nearly parallel ranges, called the Rocky Mountains proper, the Wahsatch, the Humbolt, and the Sierra Nevadas, between which are the great elevated basins called the Green River, the Salt Lake, and the Humbolt Valleys.

Causes of Periodical Fevers. — The fact that this variety of fevers is limited in its prevalence by certain geographical and topographical boundaries, shows that its essential cause arises from some conditions pertaining to the soil itself. As I have already stated, these conditions relate to the temperature, moisture, and decomposable vegetable matter. Where these exist in proper proportions, something is brought into existence, or excited to activity, which is capable of exerting such influence upon the human system as to cause the development of those pathological changes and symptoms which constitute periodic or malarial fevers. As it requires not merely an elevation of temperature, but the maintenance of such elevation for at least two months, it brings the time for beginning the active development of the specific agent or influence past the climax of summer-heat, and continues it until the temperature falls too low in the autumn. Hence, the chief prevalence of these fevers in this city, as well as in all the middle and northern parts of this country, is during August, September, and October. In some seasons they begin to prevail earlier, and in others continue quite prevalent through the month of November. In those locations where the circumstances are highly favorable for generating the specific cause, it is quite common to have a moderate prevalence of the intermittent form of the disease during the first continuous warm weather of spring. Irregular and relapsing cases are met with occasionally at all seasons of the year.

That the local conditions I have enumerated as favorable for the prevalence of these fevers, give rise to the development of a specific materies morbi, which constitutes their efficient cause, is clearly indicated by the following facts: First, persons previously healthy are often attacked with some form of the fever, as the result of spending only one or two days, at the proper season, in localities where the favorable conditions are highly concentrated, as on some parts of the coast of Africa, the campagna of Rome, or the swamps of Louisiana. Second, persons living in districts where the fevers are actively prevailing, are found to greatly lessen their liability to an attack by refraining from going out after the atmospheric vapor begins to condense in the form of dew in the evening, and until after it has again been dissipated and risen above the lower strata of the atmosphere in the morning. Third, families living on hillsides, so situated that the fog or vapor arising from a neighboring marsh or moist alluvial plain, is wafted by the atmospheric currents or prevailing winds against them, have often been found to suffer more than their neighbors lower down the hillside and nearer to the marsh. So, also, families and whole settlements which had been for many years entirely exempt from this variety of sickness, have become sorely afflicted every season, after the cutting away of a grove or strip of forest trees, which had intervened between them and a more or less extensive marsh. Fourth, repeated instances have occurred in which the drinking of water from springs, rills, and wells supplied or percolating from a neighboring marsh or rich alluvial soil, has caused attacks of the disease. On the other hand, locations previously highly infested with the disease, have been rendered quite exempt by thorough drainage and cultivation. So true is this, that large portions of our country, in which malarious fevers prevailed severely during the first two generations after their settlement, have now become nearly exempt from such prevalence.

These and kindred facts not only prove that a specific material substance of some kind is produced, but that it is capable of being held suspended in water and in aqueous vapor, and that its diffusion in the atmosphere is governed by the same laws as govern the diffusion of the latter. From a very early period this substance, or *materies morbi*, has been called *malaria*, marsh-miasm, koino-miasm, etc., under the belief that it was a subtle gas evolved by the action of heat on moist, decomposing vegetable matter in the soil. Until a recent period this theory was generally accepted by the profession, although the supposed gas successfully eluded every effort of the chemist to isolate and identify it. Suggestions were made from time to time, that the special agent is an organic germ, either animal or vegetable. One of the earliest and ablest advocates of the theory that malaria is a species of fungus or vegetable germ, was Dr. J. K. Mitchell, for many years one of the faculty of Jefferson Medical College, who gave the results of his observations and experiments in an interesting little volume, published in 1849. In 1866, Dr. J. H. Salisbury, of Cleveland, published the results of his investigations, claiming that the active agent is a vegetable organism of the algoid class, called *palmella*. Several years since, Dr. John Bartlett, of this city, reported to the Chicago Medical Society the results of an interesting series of investigations, somewhat confirmatory of the conclusions of Dr. Salisbury. And within the last two years, Drs. Klebs and Tommasi Crudeli have published the results of a still more extended series of observations near Rome, in which they claim to have proved that the essential cause of periodical fever is a low form of vegetable organism which they call *bacillus malariæ*. They made a watery extract from the marshy soil of a malarious region, containing these germs, and by injecting it into rabbits, produced symptoms which they regarded as diagnostic of malarial fever. These gentlemen certainly succeeded in killing the rabbits, but the symptoms preceding their death were by no means identical with those of any variety of malarious fever. Moreover, the known readiness with which rabbits and guinea pigs are affected by the injection of almost any organic material into their blood or tissues, renders them wholly unfit for use in such investigations. During the past year, Dr. G. M. Sternberg, of the U. S. A., at the request of the National Board of Health, has been still further pursuing the same line of investigation as the Italian physicians, with additional observations concerning both the specific characters of the so-called *bacillus malariæ*, and the range of temperature that rabbits may undergo when under no unnatural influence. From the facts given in his report recently published,* I am satisfied that the evidence thus far developed is wholly insufficient to justify the conclusions arrived at by Klebs and Tommasi Crudeli. On the contrary, the disease they produced in their rabbits differs in no essential symptoms or *post mortem* appearances from that produced in the same species of animal by the injection of healthy human saliva or any other organic material capable of undergoing septic changes; and their bacillus malariæ differs in no recognizable specific characters from bacilli found in almost any foul water, under the influence of a summer temperature. The real nature and origin of the specific cause of periodic fevers is, therefore, still a mystery. The circumstances or conditions necessary for its production, and the laws governing its diffusion, have been well ascertained, as I have already stated to you; and we may properly call it malaria, without intending thereby to imply anything

* See Experimental Investigations by George M Sternberg, Surgeon U. S. A., relating to the Etiology of Malarial Fevers. National Board of Health Bulletin, Appendix No. 2.

concerning its nature, until further investigations shall result in its more perfect identification. Age and sex appear to exert little or no influence over the liability to attacks of malarial fever.

Varieties. — All the varieties of periodical or malarious fever may be conveniently grouped under three heads, viz.: Intermittent, Remittent, and Pernicious. The first includes all those cases characterized by paroxysms of fever of brief duration, with an interval of time between them, during which all febrile symptoms are absent. The second includes all such cases as are characterized by active paroxysms of fever, with a regular interval between them, during which the febrile symptoms are greatly diminished but not entirely absent. Instead of a complete *intermission*, as in the first variety, there is only a *remission*. The third includes all such cases as are characterized by a dangerous degree of depression during the first stage of the paroxysm.

In all the varieties the paroxysms recur at stated periods of time, with a near approach to regularity. In some cases they return at a given time every day ; in others every second, third, fourth, fifth, sixth, or seventh day ; and are technically called respectively, quotidians, tertians, quartans, quintans, sextans, and septans. Cases are also known in which the paroxysms return every fourteenth day. Very much the larger number of cases of the intermittent variety present a febrile paroxysm every day or every second day. The next most numerous cases have a paroxysm every seventh or fourteenth day. In the remittent variety the paroxysms very generally recur every day. In the pernicious cases, if the patient does not die in the first paroxysm, they may take either the intermittent or remittent type, but much the larger number present the characteristics of the former. Most writers mention cases in which two paroxysms occur in one day, and call them double quotidians, double tertians, etc. According to my experience, such cases are exceedingly rare. I have already made frequent mention of the words paroxysm, interval, intermission, and remission. A *paroxysm* of malarial fever consists of three stages, each presenting a distinct group of symptoms, and following each other in a pretty uniform order ; namely, the algid or cold stage, the hot or pyretic stage, and the declining or sweating stage. The *interval* is the length of time from the commencement of one paroxysm to the beginning of the next. The *intermission* is the length of time from the end of one paroxysm to the beginning of the next. The *remission* is the period of time from the decline of one paroxysm to the accession of the next, and applies only to the remittent variety of fever.

General Pathology.—A study of the general pathology of periodical fevers necessarily involves a consideration of the *modus operandi* of their specific cause, called malaria. This agent evidently gains access to the human system chiefly through the lungs, by inhalation with the air and aqueous vapor, and to some extent also, through the stomach with water and other liquids, capable of holding it in solution. When received into the blood through either channel in sufficient quantity to produce general disturbance, it acts upon the properties of the tissues as an irritant, increasing the general susceptibility, and at the same time impairing the force of vital affinity, while it exerts a special local influence over the functions of the vasomotor nervous system. The irritant effect gives to the febrile movement the same rapidity of development and active excitement that belongs to the febriculæ, while the impaired tonicity of the tissues favors congestions or the undue accumulation of blood in the more vascular structures, such as the spleen, lungs, liver, and mucous membranes; and and at the same time the special action on that part of the vasomotor

nerves controlling the peripheral circulation is such that the vessels of the surface become much contracted, causing it to appear pale, shrunken, and cold. But the rapid accumulation of heat in the internal hyperæmic structures soon increases the temperature of the blood to such a degree that it overcomes the contraction of the peripheral vessels, and not only carries the increase of heat throughout the whole system, but ultimately coöperating with the impairment of vital affinity, causes that relaxation which constitutes the sweating stage, and ends, for the time being, the febrile excitement. If the relaxation is complete, allowing a free exudation or sweating from the cutaneous surface, the exciting cause appears so far removed that all active phenomena cease, constituting the intermission. If the relaxation be only partial or imperfect, allowing only a lowering of temperature with slight moisture of the surface, it constitutes only a remission between the paroxysms. The first represents the intermittent, and the second the remittent variety of periodical fever. But when, from the intensity of the action of the malaria or some peculiarity in the condition of the patient, the vital affinity becomes so impaired as to greatly retard all molecular changes, and not only the vasomotor function of the periphery, but of the whole system, is perverted, the active generation of heat fails internally as well as externally, allowing the cold stage to continue, with shrinking, blueness, and coldness of the surface; a rapidly failing pulse; unsteady respiration; entire suspension of innervation and secretion, and death within a few hours.

Such cases constitute the true algid variety of pernicious intermittents. When the extreme impairment of the vital affinity is coupled with such an alteration of the vasomotor influence as causes paralysis or relaxation of the vessels of the mucous membrane of the alimentary canal, as well as of the cutaneous surface, giving rise to copious, thin or serous discharges by vomiting and purging—which often ends in complete collapse and death during the first paroxysm—it constitutes the choleraic variety of the pernicious cases. Sometimes, on the accession of a paroxysm, the extreme failure of vasomotor influence is limited mostly to the pulmonary vessels, including an engorgement of the vascular capillary network, so complete as to cause rapid exudation and compression or filling up of the air-cells, and consequent speedy death of the patient by suffocation.

A similar but less intense impairment of the vital affinity and vasomotor nerve influence, limited mostly to the brain or cerebro-spinal nerve centers, causes the pernicious cases styled in your text-books *Soporose* or cerebro-spinal intermittents. Such are the morbid processes which constitute the essential pathology of the different varieties of malarial fever. If the patient lives through the first and second paroxysms, as in the ordinary variety of intermittent and remittent cases, and the disease continues its natural course, other important pathological changes take place, with greater or less rapidity, during the further progress of each case. The active disturbance of those elementary properties of the tissues on which the molecular changes constituting nutrition, disintegration, and secretion depend, with the renewed hyperæmia of the digestive and assimilative organs at each returning paroxysm, arrests or greatly retards the formation of new organizable constituents of the blood, especially the red corpuscles and albumen; and at the same time the disintegration and waste of those already existing are increased, both by the heat and excitement of the paroxysms, and sweating or other evacuations at their close. Consequently, the blood becomes rapidly impoverished of its red corpuscles, albumen, and some of its salts, while the fibrin, white corpuscles, and extractive matter remain in nearly natural proportion. In addition to

these changes, the microscope shows the existence, in the serum of the blood, of many small black specks or granules, apparently derived from the hæmatin of the disintegrated red corpuscles.

This same pigment or coloring matter is found staining the walls of the blood-vessels quite generally, giving rise to a somewhat characteristic change of color in the liver and spleen, and doubtless contributing to the formation of that sallow hue of the surface generally presented by persons subject to protracted ague. The extreme degree to which the blood is deprived of its red corpuscles in some cases of protracted intermittents, was shown by some of the analyses made by myself in 1852.*

In one instance, the blood taken from a vein in the arm of a laboring man who had had a paroxysm of simple intermittent fever every day for about ten weeks, yielded, on very careful analysis, only 49.19 per 1,000, or a little less than *five* per cent. of red corpuscles ; 64.84, or less than 6.5 per cent. of albumen, and 1.38 or 0.13 per cent. of fibrin. In another case, also analyzed in November, 1852, the blood taken from the arm of a laboring man aged 23 years, who had suffered from quotidian ague six weeks, gave 82.79 per 1,000, or 8.2 per cent. of red corpuscles ; 69.68, or near 7 per cent. of albumen ; and 2.48, or near 0.25 per cent. of fibrin. Both the specimens of blood I have alluded to were also subjected to a careful examination with the microscope. The red corpuscles appeared to me slightly distended or more globular than natural, and some of them had a corrugated or shrivelled appearance, as if undergoing disintegration. The white corpuscles were less numerous than in healthy blood. There were also many minute dark granules floating in the serum. Between the years 1856 and 1859, Dr. Joseph Jones, then Professor of Medical Chemistry in the Medical College of Georgia, at Augusta, made a large number of analyses of blood from patients laboring under different grades of malarial fever, the results of which he gave in a lengthy and important paper presented to the American Medical Association in May, 1859. So far as relates to the alteration of the relative proportion of the constituents of the blood, his analyses led to the same results as my own.†

In addition to his chemical analyses, Dr. Jones embraced opportunities more frequently presented in the intensely malarious district in which he then lived, for making minute *post mortem* examinations of many fatal cases of remittent and pernicious intermittent fevers, and found the serum, or liquor sanguinis, of a decided yellow color ; unusually extensive and numerous fibrinous clots in the cavities of the heart and larger blood-vessels, of such firmness and freedom from colored corpuscles as to indicate their formation before death ; and in most cases enlargements and alterations in the color of the liver and spleen. He states that the blood in the liver and spleen does not change to a brighter hue on exposure to the oxygen of the air, as in other parts of the body, and that in the many cases examined for that purpose, he uniformly found the liver containing an increase of animal starch or glucogene, but no grape sugar.

In nearly all the cases of death from the remittent type of fever, the

*See Report on the Changes which take place in the Blood in the Continued and Periodical Fevers, read to the Illinois State Medical Society in June, 1857. By N. S. Davis, M. D., etc. Published in the Transactions of the Society for 1857, and also in the Northwestern Med. and Surg. Journal, Vol. VI, New Series, pp. 389–398.

†The following are the conclusions of Dr. Jones, in his own words : 1. The careful comparison of the table of the changes of the blood in malarial fever, with the formula of the blood, established by laborious investigations, *reveals the fact that the colored blood-corpuscles are diminished during malarial fever.* 2. The careful comparison of these analyses with each other, reveals the fact that the *extent and rapidity of the diminution of the colored corpuscles* corresponds to the severity and extent of the disease. 3. Our researches show that the fixed saline constituents of the blood-corpuscles are often diminished in malarial fever. See Transactions of the American Medical Association, Vol. XII, pp. 379 and 385. 1859.

mucous membrane of the stomach and duodenum was found congested with blood ; and in some instances the same changes were found in the ilium, accompanied by tumefaction of the glands of Peyer. Without occupying your time with further details, I will close this part of the subject by submitting the following brief propositions : —

1st. The essential cause of periodical fevers gaining access to the blood, chiefly through the lungs and stomach, by its presence, exerts an excitant or irritative influence on the susceptibility of all the organized tissues of the body, while it so modifies the vital affinity as to impair their tonicity and lessen the natural molecular changes constituting assimilation, nutrition, and secretion ; and at the same time so modifies the action of the vasomotor nerves as to induce contraction of the peripheral or cutaneous vessels, while those of the viscera and internal structures remain unaffected or dilate from the general impairment of tonicity.

2nd. When the cause acts feebly, but persistently, through considerable periods of time, the pathological conditions just stated will not be developed in sufficient degree to present the active phenomena of fever, but will so retard hæmatosis and nutrition as to cause spanæmia, or impoverishment of blood corpuscles, imperfect secretions, and want of muscular and nervous force, — a condition often called malarial cachexiæ.

3d. When the cause acts with sufficient intensity to actively develop the morbid impressions indicated in the first proposition, the coincident contraction of the vessels of the periphery, and suspension of heat-production there, with the undue excitability and rapid accumulation of blood and heat in the more vascular and relaxed internal organs, speedily presents all the phenomena of the first or cold stage of the febrile paroxysm. But such a disparity in circulation and temperature between the external and internal parts of the body, must of necessity be of short duration. Either the irritative quality of the exciting cause will predominate, and the rapidly increasing temperature and blood-pressure internally will increase the force and frequency of the action of the heart and larger blood-vessels, and soon cause the vessels of the periphery to relax and become hot and turgid with blood, constituting the second or hot stage of the paroxysm ; or, that quality of the exciting cause which impairs the play of vital affinity will so far predominate that when the first stage of the paroxysm is induced, there is not sufficient tone or molecular attraction in the cardiac and involuntary muscular structures to maintain efficient contractions. Consequently the circulation will grow more feeble, the respirations more irregular and inefficient ; natural secretory actions will cease; the capillary circulation will be retarded as much in the internal structures as in the cutaneous surface ; the blood, with its rapidly disintegrating red corpuscles, will accumulate in the spleen, liver, and sometimes the lungs ; and in a few hours the patient dies in what is called a pernicious or congestive paroxysm.

4th. When the irritative influence predominates and the hot stage of the paroxysm readily supervenes, the rapid increase of heat in the tissues, and the equally rapid increase of effete matter in the blood, both from retarded eliminations and morbid changes in the corpuscular elements of the blood itself, soon begin to neutralize the excessive excitability, and in a few hours the cutaneous vessels become entirely relaxed, permitting copious sweating, with a coincident resumption of more natural secretions in the internal organs, and accompanied by an entire subsidence of fever or an intermission. In other cases the cutaneous relaxation and sweating is only partial, accompanied by an equally imperfect subsidence of the fever or a remission. But in either case, if not interfered with by treatment, the

intermission or remission continues only for a definite limited time, when the susceptibility to the action of the special cause is regained, and the successive stages of another paroxysm supervene; and this regular succession of morbid phenomena may continue without any definite self-limitation.

5th. When the morbid phenomena just named are permitted to recur from day to day, the high excitement, coupled with vascular hyperæmia of the abdominal viscera, that is renewed with the access of each paroxysm, tends strongly to establish either sub-acute inflammation in the spleen, liver, gastro-intestinal mucous membrane, and lungs, or a rapid enlargement of the two first-named organs, partly from excessive accumulation of the corpuscular elements of the blood, and partly from actual hypertrophy of their tissue. In the meantime, the blood itself is undergoing rapid impoverishment of its red corpuscles, both from their more active destruction and the continued interference with the natural processes by which they are reproduced.

Such, gentlemen, are my views of the *modus operandi* of malaria, as the efficient cause of periodical fevers; and of the pathological conditions and processes that characterize the several stages and varieties of this very important group of acute general diseases. A consideration of their clinical history and treatment must be reserved for another hour.

LECTURE XXI.

Periodical Fevers Continued—Intermittent, Remittent—Their Symptoms, Diagnosis, Prognosis and Treatment.

GENTLEMEN:—The active febrile symptoms in almost all cases of malarial fever, are preceded by feelings of indisposition, consisting in dull pains in the head, back, and limbs, more especially during a certain part of each day; variable appetite; undue sensitiveness to atmospheric changes; and more or less derangement of the secretory functions generally. These prodromic symptoms may continue from two days to as many weeks. For both convenience and accuracy, I shall describe the symptoms of each variety of the fever separately.

Intermittents.—The symptoms of intermittent fever are naturally divided into those belonging to the paroxysm and those of the intermission. As I stated to you in the preceding lecture, the paroxysm is made up of three stages, and each of these is characterized by a distinct group of symptoms. The cold stage is ushered in by feelings of coldness and general depression; shrinking and paleness of the skin, and a leaden hue of the lips and nails; the coldness being first in streaks along the spine, soon deepens into general shivering and muscular trembling, with chattering of the teeth; a small and variable pulse; short and irregular respiratory movements; often increased secretion of limpid urine, and dull pains in the head, back, and limbs. In many cases there is frequent sighing, and a very uncomfortable sense of oppression in the epigastrium, with a general feeling of weariness. While the patient thus feels depressed, as if from

intense cold, the application of the clinical thermometer shows the actual reduction of temperature to be limited to the surface of the body and extremities, while it is two or three degrees above the natural standard in the mouth and rectum. The average duration of the cold stage is from thirty to forty-five minutes. In some cases it is no more than ten or fifteen minutes, and may be absent altogether. On the other hand, it has been observed to last two and three hours in some rare instances. The transition from the cold to the hot stage is generally gradual, though occupying not more than ten or fifteen minutes. The patient first becomes more quiet, takes deeper and more regular inspirations, his shivering ceases, irregular streaks of warmth come and go along the spine, like the streaks of cold at the beginning of the cold stage ; then warmth appears in the cheeks, the leaden hue disappears from the lips and nails, and soon the whole surface becomes warm, the skin smooth, the face flushed, the pulse and respirations full and uniform, but more frequent than natural. In the meantime, the patient has been gradually throwing off his extra coverings and calling for the removal of the hot things that had been applied to his surface and extremities, until he complains of the excess of heat as much as he did of the cold a short time previous.

The hot stage thus fairly established, is characterized by general heat and dryness of the surface; flushed face and rather excited expression of countenance; pulse full, and from 90 to 100 in frequency; respirations moderately accelerated; the lips red and dry; tongue generally coated with a thin, rather yellowish-white fur; the urinary secretion now scanty and high-colored; and the patient complains of much heat, thirst, restlessness, throbbing pains in the head, with some general soreness of the flesh and sensitiveness to light and noise; some tenderness and distress in the epigastrium, and, not unfrequently, active vomiting, especially after taking drinks freely. The temperature continues to rise after the accession of the hot stage, and generally reaches its climax for that paroxysm in about one hour after the disappearance of cold from the surface and extremities, when it ranges between 40° and 41° C. (104° and 106° F.) in the axilla.

All the symptoms mentioned usually continue with but little change from two to four hours, when the patient begins to rest more quiet, and complains less of headache and thirst. Soon a slight moisture appears on the forehead, in the axilla, and in the palms of the hands, and in half an hour more the whole surface is covered with a copious sweat, which may continue from two to four hours, during which time the patient usually sleeps quietly. The sweat is generally copious enough to wet thoroughly all the clothing in contact with the patient.

The sweat contains an unusual amount of organic matter, fat acids, and salts ; and gives a strongly acid reaction ; and during its progress all the active symptoms of the hot stage disappear, leaving the pulse, respiration, and temperature natural, and the patient comfortable, except a sense of weakness and weariness on attempting any exercise, and sometimes a light coating on the tongue and indifference to food.

The urea, urates and chlorides, which had been largely in excess in the urine during the hot stage, rapidly decline during the sweating, and fall below the natural proportion in the intermission. From the description I have given, you will perceive that the three stages united make the entire length of a paroxysm from five to nine hours, leaving from fifteen to nineteen hours for the intermission in the quotidian, and from thirty-nine to fourty-three hours in the tertian variety. At the end of the intermission the cold stage again commences, and is followed by the same succession of stages, and characterized by the same symptoms as in the first

paroxysm. The recurrence of paroxysms and intermissions may thus continue with a near approach to regularity, both in time and symptoms, if not interfered with by treatment, for an indefinite period of time, during which the blood is steadily becoming more and more impoverished of its red corpuscles and nutritive constituents, the epigastrium more constantly tender to pressure, and the liver and spleen, from the repeated congestions, considerably enlarged ; and the skin of a sallow color, from the combined effect of altered blood corpuscles and retained coloring matter of bile. When the disease thus continues for several weeks, it is called chronic ague, and is sometimes accompanied by such a degree of impoverishment of the blood and impairment of the tone of the tissues as to induce general dropsical infiltration, or œdema of the areolar tissues. In some cases of intermittent fever each succeeding paroxysm commences a little earlier than the preceding one, and its hot stage continues longer, thereby shortening the intermission. Such cases, if not interfered with, are liable to become converted into the remittent form during the second week of their progress. On the other hand, there are cases in which each succeeding paroxysm begins from one to two hours later than the one preceding.

These often terminate spontaneously in convalescence during the second or third week of their progress. Besides these variations in the progress and termination of different cases of intermittent fever, you will meet with occasional variations in the order and phenomena of the several stages of the paroxysm itself. In some, the cold stage will be wanting, or so slight as to be hardly noticeable. In others, the hot stage will be disproportionately long, and the sweating stage less profuse. These constitute what Dr. D. Drake called inflammatory intermittents. The paroxysm may commence in any part of the day; but in far the larger number of cases it begins between six and eleven o'clock A. M. In the intermissions between the paroxysms, the patient often feels no other consciousness of being ill, than a sense of debility, or getting easily tired on exercise of body or mind. In some cases, however, the tongue remains coated and the secretions unnatural, with a sense of fullness in the epigastric and hypochondriac regions, from congestion or enlargement of the liver and spleen. In highly malarial districts, cases are met with in which there are no open paroxysms of fever, and yet the patients grow pale, lose their appetite, and experience a sense of heaviness, and dull pains in the head, back, or limbs during a part of each day. Although these cases present no marked chills or heat of surface, yet the thermometer in the mouth or under the tongue shows a rise of two or three degrees of temperature each day. These are called *latent* intermittents.

When a similar condition of the system, depending on malarial influence, exists coincidently with other diseases of an inflammatory character, the intermittent is said to be *masked.* Cases also frequently occur, in which a severe paroxysm of neuralgia recurs at a stated period each day or every second day, and appears to take the place of the febrile exacerbation.

Remittent Fever. — The remittent variety of malarial fever prevails in the same localities, at the same seasons of the year, and under the same circumstances as the intermittent variety. Its prodromic or forming stage is the same ; and its first paroxysm is ushered in by the same well marked cold stage or chill, followed by a hot stage, presenting every characteristic symptom of the hot stage of an intermittent, except that it continues much longer, being usually from twelve to eighteen hours ; and instead of terminating in a full, copious sweat, with entire disappearance of febrile phenomena, it subsides only so far that the skin becomes moist,

the pains cease, and the patient sleeps, but the pulse continues from ten to fifteen beats per minute faster than natural, and the temperature from one to three degrees higher.

Hence it is called a remission or diminution of the fever, instead of an intermission. About the same hour that the initial chill occurred, which is, in most cases, between seven and eleven o'clock A. M., the febrile paroxysm recommences, and continues through the same length of time, and presents the same active symptoms as the first, except that the cold stage is less marked; and after the first two days amounts only to a brief period of coldness of the extremities, a little blueness of the lips and nails, paleness of countenance, and a desire for more clothing or covering on the bed. The paroxysms thus commenced, in remittent cases usually recur every day; and as the hot stage, or period of high irritative excitement, is protracted, and the subsidence only partial, the patient becomes more rapidly exhausted; the tenderness and sense of oppression in the epigastric and hypochondriac regions, more severe and constant; the urinary secretions more scanty and high colored; the tongue more thickly coated and mouth more dry; the mind more likely to be wandering or delirious during the height of each paroxysm; and before the end of the first week the skin is apt to become more or less yellow, with physical signs of enlargement of the liver and spleen. When this variety of fever is not materially modified by treatment, the cases are found to progress in three directions. In the more severe attacks, especially in the warmer climates, the initial chill is severe, and the hot stage characterized by intense throbbing pain in the head, with more or less delirium; great epigastric distress, with frequent vomiting of yellow or green fluid; very scanty urine; severe engorgement of the liver and spleen, indicated by enlargement of those organs; a rapid pulse, and temperature of 41° to 43° C. (106° to 110° F.); and a remission characterized by much weakness and little or no perspiration. Under the daily renewal of such paroxysms, the patient becomes rapidly prostrated; the remissions less marked; the pulse more rapid, but soft; mind more continuously wandering; mouth and tongue dry with sordes; skin and eyes yellow; epigastric and hypochondriac regions full; sometimes spontaneous diarrhœa; and somewhere between the fifth and ninth days entire suppression of urine, involuntary intestinal discharges, complete collapse, and death. Some of these cases are accompanied by petechial or hemorrhagic spots on the surface, or by more copious discharges of blood from the stomach and bowels, or both. Late in the autumn, and in the spring, these severe cases are often accompanied by a dangerous degree of pneumonic engorgement of the lungs.

Cases of the same class but a little less severe, often occur, in which the hot stage of the paroxysm becomes more and more prolonged, until the daily remission is nearly obliterated, and all the symptoms approximate closely to those of severe typhoid fever; and in the latter part of the second, or during the third week, they exhibit the dry, brown tongue, subsultus, mental wandering, and imperfect control over the sphincters, that indicates the near approach of a fatal result. Another, milder, class of cases are met with in which the hot stage of each returning paroxysm is shorter than the preceding one, and the remission more distinct. The tendency of such is to terminate, about the end of the first week, in a full sweating stage and complete intermission, to be followed by ordinary paroxysms of intermittent fever, either of the quotidian or tertian form. A still milder class of cases run about the same course as the last mentioned, and terminate in a full intermission and permanent convalescence.

Pathological Anatomy.—The pathological changes in the blood and

different organs of the body were so fully stated in the preceding lecture, when discussing the general pathology of malarial fevers, that only a few words need be added here. The post mortem appearances presented in fatal cases of intermittents and remittents are nearly the same. Leaving the pernicious or truly malignant cases for separate consideration, I may state that the chief changes observable on post mortem examinations are the diminution of the red corpuscles and appearance of black pigment granules in the blood; the appearance of the latter in many of the organs and tissues of the body, but more especially in the spleen, liver, and marrow of the bones; the decided congestion and tumefaction of the spleen, liver and mucous membrane of the stomach and duodenum; and sometimes a moderate degree of tumefaction of the solitary and aggregated glands of the ilium, the latter presenting what has been called the *shaven beard* appearance.

When death has taken place early in the progress of the general disease, the liver and spleen present a dark bluish color, and their enlargement is caused chiefly by the accumulation of dark blood. When the course of the disease has been more protracted, these organs are more dense from some hypertrophy or hyperplasia of the connective tissue and increase of lymphoid cells, and the color of the spleen is lighter or nearer slate color, and that of the liver more of the olive yellow, varying from light olive to the bronzed hue. In the more protracted cases some degree of the fatty, waxy and amylaceous molecular degenerations can also be found in the parenchyma of many of the organs, but in much less degree than in the continued fevers, as the typhoid and typhus.

Diagnosis.—The unmixed or uncomplicated cases of either intermittent or remittent fever are easily distinguished from all other general febrile affections when they have progressed far enough to pass one or more paroxysms. The well marked initial chill, followed by a high irritative grade of fever, with its rapid rise of temperature, continuing from three to eighteen or twenty hours with an equally rapid decline, nearly or quite to the standard of health, the same to be repeated at intervals nearly regular as to time, every day or every second day, constitute an assemblage of symptoms so different from those of all the other fevers, that no other diagnostic marks are needed. It is only when the specific causes of yellow fever, or of typhoid or typhus are actively prevalent at the same time and in the same places with the malarial fevers, that you will meet with cases in which the symptoms of different types of fever become so blended in the same case, as to lead you into errors or uncertainties regarding the diagnosis of individual cases. That such blending is not only possible, but of frequent occurrence in all places naturally malarious, into which the causes of yellow and typhoid fevers are introduced, either by commerce or by accumulations of population, I have already abundantly shown in the lectures on those diseases. And at the same time I pointed out the most available means for maintaining the line of differential diagnosis in such cases, and will not repeat them here.*

Those protracted cases of remittent fever, in which, during the third week, the fever becomes more continuous, with mental wandering, dry, brown tongue, some degree of subsultus, and perhaps diarrhœa, if presented to you for the first time in that condition, with no one present to give a correct history of the case, might cause you to hesitate or feel uncertain in regard to the question as to whether it was malarial or true typhoid. But even in such cases, there is a more yellow shade of color in

*See pp. 90-91 and 145 of this Vol.

the skin and eyes, greater paleness of the prolabia from impoverishment of the red corpuscles of the blood, and less abdominal tympanites, than in the corresponding stage of typhoid fever.

Prognosis.—Excluding the cases of a decidedly pernicious character, periodical fevers, whether intermittent or remittent in form, are not attended by a high ratio of mortality. And in such cases as do terminate fatally, death is generally caused by the supervention of local inflammations in some of the important organs, and not from the gravity of the general disease. Yet, if either from neglect or inefficiency of treatment, the fever is allowed to run an unusually protracted course, the progressive impoverishment of the blood and impairment or perversion of molecular changes in the tissues, may cause fatal exhaustion. As a rule, the ratio of mortality is much greater in warm or tropical climates, than in the temperate or colder regions. It is much greater in some years than in others in the same locality. Neither age, sex, color or nationality, appear to have any influence over the liability to be attacked, or over the resulting mortality. One attack does not in any degree lessen the susceptibility to subsequent attacks, but rather the reverse. The disease is not in any degree contagious; neither is its cause portable or capable of being carried from place to place.

Treatment.—There are three distinct objects to be accomplished in the treatment of all non-malignant cases of periodical or malarial fevers, namely: first, to palliate or lessen the more important symptoms during the paroxysms; second, to interrupt or prevent their recurrence; and, third, to aid in restoring the proper proportion of the constituents of the blood, and the natural condition of the properties of the tissues, and thereby more certainly prevent relapses. The several stages of a paroxysm of an ordinary intermittent fever are so brief, that very little treatment of a positive character is needed. The patient should be placed in bed as soon as the cold stage is felt approaching, well covered, with the addition of bottles of hot water, hot bricks, or other means of dry warmth to the extremities; and if any medicine is administered internally, from two to three cubic centimeters of chloroform (min. xxx to xlv) given at once, well diluted with sugar and water, will be more likely to lessen the severity and duration of the cold stage than any other remedy. The common custom of allowing the patient to drink freely of hot, pungent, or stimulating drinks during the cold stage, is worse than useless. By filling the stomach with such liquids, you are much more likely to provoke vomiting and increase the epigastric distress as the hot stage supervenes, than you are to lessen the severity of the chill. Dr. Mackintosh of Edinburgh recommended free bleeding at the beginning of the cold stage; Dr. Wright, of Chatham, Illinois, recommended hypodermic injections of sulphate of morphia; and many others have given a full dose of opium, for the same purpose. While there is abundant evidence that either of these remedies, will in many cases, greatly lessen the severity of the cold stage, the danger of producing either direct or secondary bad effects, more than counterbalances all the benefit they can produce in ordinary cases of malarial fever. When the hot stage supervenes, and the skin becomes hot and dry, frequent sponging of the surface with cold water; the application of cold cloths to the head; cooling drinks in small quantities but frequently repeated; and moderate doses of an efficient arterial sedative, will contribute most to mitigate the severity of the febrile excitement, lessen the tendency to kindle up inflammatory complications, and add to the comfort of the patient. The best sedatives for this purpose are aconite and veratrum viride. From 0.06 to 0.12 cubic

centimeters (min. i to ii) of the strong tincture of either may be given every hour until the hot stage begins to decline, when it should be suspended. This is all the treatment necessary so far as relates directly to the paroxysms of ordinary intermittents. But in remittents, in which the hot stage is more protracted, and the symptoms of gastric irritation and visceral congestions are more prominent, it is better to give the arterial sedative in larger doses, at intervals of once in two hours, and at the intermediate hour give a powder composed of calomel 0.13 grams (gr. ii) and bicarbonate of sodium 0.33 grams (gr. v). These, like the sedative, should be discontinued on the decline of the paroxysm, and if the bowels fail to move during the next twelve or eighteen hours, a laxative should be given sufficient to effect that object. During the sweating stage, or decline of the paroxysm, no special treatment is required except rest and dry clothes when it is ended. To accomplish the second object I have named as important, namely, to prevent the recurrence of the paroxysms, requires the use of the class of remedies called anti-periodics. Of these the sulphate of quinia is, undoubtedly, the most reliable, in the great majority of cases. But the other alkaloids of the Peruvian bark, the active principles of the bark of the cornus florida, the salix alba, etc., possess sufficient efficacy to be used with advantage in many cases; more especially in such patients as are affected unpleasantly by the quinine. It is probable that quinia and all the vegetable alkaloids possessing anti-periodic properties, produce their curative influence by directly antagonizing the effects of the malaria on the properties of the tissues and the function of the vaso-motor nerves. In the preceding lecture I stated that the essential or direct pathological conditions produced by malaria, were, an increase of the susceptibility of the living structures, a diminution or impairment of the vital affinity, and such an influence on the vaso-motor centres as to induce active contraction of the whole system of peripheral or cutaneous vessels. The sulphate of quinia, however, when used in fair doses, directly diminishes the susceptibility, while it increases the force of affinity in the tissues, and so impresses the vaso-motor centres as to favor relaxation, if not temporary paralysis, of the vessels of the surface. In small doses its influence on the vital-affinity and consequent tonicity of the tissues predominates, and hence when thus administered it has been regarded as a tonic. In large doses its effect in directly diminishing the susceptibility or excitability of the structures and modifying the vaso-motor function, caused it to be claimed, in former times, as a powerful sedative,* and more recently as an anti-pyretic. That it is capable of producing these effects, even to a degree destructive of life, is fully proved by experiments on animals, by accidental experiments on the human subject, and by clinical observations at the bed-side. † It is only a few days since, that I saw a patient with typhoid fever, evidently complicated with malarial influence, in which the exhibition of moderately full doses of quinine for three or four days in succession, had induced great impairment of hearing and vision, and a dangerous degree of depression, with insomnia, and what the family called "sinking spells."

Some practitioners have attributed to quinine important germicide properties; but I do not think its effects on the human system are, in any degree, dependent on its power to destroy bacteria or micrococci. The arsenical preparations have long been known to possess valuable anti-

* See paper in the American Journal of Medical Sciences for July, 1844, by Wm. M. Boling, M. D., of Montgomery, Ala.

† See paper on the "Poisonous Properties of Quinia," by Wm. O. Baldwin, M. D., of Montgomery, Alabama, in the American Journal of Medical Sciences, 1847. Also in the Medical Gazette, New York, for October 22d, 1881.

periodic or anti-malarial properties. The most efficacious of these preparations, is the Liquor Potassii Arsenitis. More recently it has been found that the sulphites or hypo-sulphites of sodium, calcium and magnesium, when given in large doses and continued for several days in succession, are capable of arresting the progress of ordinary periodical fevers. These undoubtedly act as antiseptics, neutralizing the malarial poison in the system.

My own experience would indicate that they are much slower and less certain in their influence in preventing the recurrence of fever paroxysms than the quinine or its kindred substances. As I have already stated, abundant experience has shown that sulphate of quinia is the most reliable of all the remedies hitherto used for the interruption of the paroxysms or active phenomena of periodical fever, in the great majority of cases. The next question of practical importance is, in what doses, and at what times in relation to the paroxysms, can it be administered with the greatest certainty of success and the least liability to produce unpleasant or injurious effects upon the patient? It is pretty generally agreed that, in all ordinary cases, from 0.66 to 1.33 grams (gr. x to xx) given during each of the first and second days, followed by from 0.5 to 0.8 grams (gr. viii to xii) on the third, fourth and fifth days, is sufficient to fairly interrupt the further recurrence of the paroxysms. But concerning the best mode and time of administering the quantities I have named, you will find wide differences of opinion, even among the most eminent and experienced in the profession. Some prefer to give 0.066 or 0.130 grams (gr. i or ii) every one or two hours, until the required quantity for the day has been taken; while others give the whole amount in one or two doses. Some limit the administration to the time of the intermission or remission, and others administer the remedy as freely in the hot stage of the paroxysm as at any other time. My own clinical experience has fully satisfied me that in this, as in most other matters relating to the treatment of disease, the adherence to a medium course which avoids both extremes, is attended by the highest degree of success with the smallest ratio of casualties or unpleasant effects. Consequently, I prefer to divide the whole amount to be given in the twenty-four hours into three doses, and give one on the decline of a paroxysm, another in the middle of the intermission or remission, and the third an hour before the access of the next expected paroxysm. My reasons for preferring this method are: first, as it is during the intermission or time between the paroxysms, that the exciting cause (whatever its form or nature may be) is being re-developed in the system and is re-accumulating its influence upon the properties of the blood and tissues, which is to eventuate in the re-establishment of another paroxysm; so the remedy that is expected to either neutralize or counterpoise the action of this agent, should be most actively present in the system at the same time if we would afford it the best opportunity for successful action. Second, from the sweating stage or decline of one paroxysm to the time for beginning the next, the stomach is less irritable, and consequently very much less likely to reject the medicine by vomiting, and the nervous centres less likely to be unpleasantly disturbed, than in the stage of high excitement during the paroxysm. Third, the end sought, namely the effectual arrest of the active paroxysms of the disease, is obtained with greater uniformity by so administering the remedy that its effects are continued evenly through the intermission, and are existing in full activity at the time a paroxysm might be expected to recur. I think the same reasons apply to the administration of all the anti-periodic vegetable alkaloids. It is true, however, that the use of the quantity of quinine I have indi-

cated during the first five days of the treatment, will very generally arrest the progress of simple intermittents, whether the amount to be given each day is administered in one dose or divided into ten or fifteen. And if the treatment I have suggested for mitigating the severity of the hot stage of the paroxysm be judiciously applied in the remittent cases, it will carry the decline as near an intermission as possible, and make the action of the anti-periodic almost as certain to arrest the progress of the disease as in the simple intermittents.

In addition to the measures I have already indicated, the practitioner should always give careful attention to the functions of the abdominal viscera, including the kidneys. Local irritations and perversions of function should be relieved by mild anodynes and alteratives; and secretion, especially of the kidneys, well sustained by diuretics, when indicated by scantiness of the urine. Due attention to these items need not interfere in any degree with the prompt and proper use of the anti-periodics. When you have fairly interrupted the further recurrence of febrile paroxysms, whether it has required three or five or seven days, the disease under which your patient is laboring is by no means completely cured. The blood is still deficient in red corpuscles; the tone of the nervous and muscular structures is still below the normal standard; and the molecular changes required for healthy secretory action in the important secretory organs, are unsteady from the altered affinity between the secretory cells and the elements of the blood. Consequently, if the treatment is suspended here, as is too often the case, the patient is left in the most favorable condition for a relapse. It is better, therefore, that you should always give careful attention to the third object of treatment, which I stated to be the restoring of the constituents of the blood to their natural proportion, and the properties of the tissues, regulating molecular movements, to their natural condition. For this purpose, as soon as the active paroxysms of the fever are interrupted, the patient needs to be continued on a plain, nutritious diet; he may begin passive, moderate exercise in the open air, but should be careful to avoid fatigue of mind or body; avoid exposure to the dampness of the morning and evening, while the dew is rising or falling; and take such medicines as will promote the general tonicity of the tissues, and the reproduction of the red corpuscles of the blood, and maintain healthy action of the more important secretory organs. One of the best combinations for accomplishing these objects, is the following:

℞			
	Quiniæ Sulphatis	4.00 grams	ʒi.
	Ferri Citratis	4.00 "	ʒi.
	Extracti Hyosciami	2.00 "	ʒss.
	Extracti Nucis Vomicæ	0.66 "	gr. x.

Mix. Divide into thirty gelatine capsules or pills, of which one should be given before each meal time, for the first week; one before breakfast and dinner the second week; and one before breakfast only during the third week.

Another excellent formula, which I have used for many years as a substitute for the one just given, is as follows:

℞			
	Extracti Cornus Floridæ	4.00 grams	ʒi.
	Ferri Sulphatis	2.00 "	ʒss.
	Extracti Hyosciami	2.00 "	ʒss.
	Strychniæ Sulphatis	0.06 "	gr. i.

Mix. Divide into thirty gelatine capsules or pills, of which one may

be given just as often, and continued in the same manner as those of the preceding formula.

Your knowledge of the therapeutic action of the several ingredients included in these formulæ, enables you to see that I have in each a soluble salt of iron to aid in the formation of red corpuscles; tonic doses of an anti-periodic and nerve tonic in the quinine and nux vomica of the one, and the cornus florida and strychnia of the other, to hasten the recovery of a natural degree of general tonicity; and hyosciamus to soothe the sensitiveness of the gastric mucous membrane and of the tissues generally. Seeing thus clearly the therapeutic elements you need to combine to effect the improvements needed by your patient, an adequate knowledge of materia medica and therapeutics will enable you to make a score of formulæ, each capable of accomplishing the objects you desire, but with a variable degree of efficiency. If the patient for which you are prescribing has already become quite pale from impoverishment of the blood, he may derive much benefit from some of the phosphatic compounds. Four cubic centimetres, or a teaspoonful, of the syrup of lacto-phosphate of calcium, or of iron; or the same quantity of the compound syrup of hypophosphites of sodium, calcium and iron, may be given after each meal, in addition to the capsules, or pills, before the meals. Again, in many of the patients you will find a constant tendency to constipation, which may be readily obviated by adding to either of the formulæ I have given, such proportion of gum aloes and pilulæ hydrargyri as will give from 0.015 to 0.020 grams (gr. $\frac{1}{4}$ to $\frac{1}{3}$) in each capsule or pill. In cases presenting enlargements of the spleen or liver, or both, continuing after the patient is well recovered in other respects, I have found no remedy more certainly beneficial than the chloride of ammonium, given in doses of from 0.33 to 0.50 grams (gr. v to viii), three or four times a day. It was recommended for this purpose by Dr. John Eberle, in his work on the practice of medicine, more than half a century since. It may be most conveniently administered in solution with syrup of liquorice. The practice of giving patients, while convalescing from malarious fevers, various compounds called "*bitters*," which was much in vogue in former times, and is by no means wholly abandoned yet, is a very pernicious one, and should be condemned by every intelligent physician. These compounds are usually made up of some bitter barks or roots mascerated in wine, whisky, or diluted alcohol, and of such strength that patients usually take a table-spoonful or two, from one to three times a day. The barks and roots generally used are moderately tonic and unobjectionable; but the amount of alcohol taken in all such preparations is sufficient to produce a perceptible diminution of the interchange of carbonic acid gas for oxygen by the blood in the lungs, and to retard capillary circulation by its anæsthetic influence on the vaso-motor nerves; effects that much more than counter-balance all the good derived from the bitter principles incorporated with it. The time has been when it was supposed that alcoholic liquors were, in themselves, more or less preventive or prophylactic, of malarious attacks. But experience, both in civil and military life, has shown the fallacy of that opinion.

If there are any who still entertain such a belief, or are in doubt on the subject, I would refer them to the results of an experiment tried on a large scale in connection with our army of the Potomac during the late war, as related by Dr. Frank H. Hamilton, of New York, in his "Treatise on Military Surgery and Hygiene," from page 70 to 75, inclusive. Having said what I deem necessary in regard to the ordinary intermittent and remittent varieties of malarial fever, I must reserve the consideration of the more malignant or pernicious variety of cases for another lecture hour.

LECTURE XXII.

Periodical Fevers Continued—Pernicious Fevers; their Varieties, Symptoms, Pathology and Treatment.

GENTLEMEN: The word pernicious is now quite generally used to designate a class of cases of malarial fever, which, though differing much from each other, yet exhibit a common tendency to destroy life within a short period of time. These cases were formerly called malignant by some, and *congestive* by others. They were much more prevalent during the first two or three generations, after the settlement of the more highly malarious districts of our country than at the present time.

Dr. Drake tells us they are found most frequent between the parallels of thirty-one and thirty-three degrees, which includes that belt in the Southern States comprising the rice fields, the cane brakes, and the borders of streams and bayous opening into the Gulf of Mexico. According to Dr. Drake, the next most common place to find them is along the Red River region of Louisiana, and the southern border of Lake Michigan, from Chicago around to St. Joseph. In the early settlement of the country they were quite common in the latter region, but with increase of population and its consequences they have become rare.

In Europe they have long been familiar with this variety of malarial fever, in some portions of Holland, Turkey and Austria, and also on the western coast of Africa. These are the regions where it most frequently occurs, and consequently where its peculiarities are most familiar to the profession.

You will remember that in speaking of the *modus operandi* of malaria on the human system, I deviated from the opinions most commonly expressed on this subject, which are, that malaria, whether organic or inorganic, produces its primary impression upon the nervous structures through the medium of the blood. Instead of this, I claimed that its presence in the blood produced a primary and direct effect on the elementary properties common to all the tissues; namely, susceptibility and vital affinity; and that the nervous disturbance was only a part of this more general action. I further explained that it primarily caused an increase of the general susceptibility or excitability, coincident with a decided diminution of the vital affinity by which the tonicity of the tissues and the atomic movements are controlled. In speaking yesterday of the symptomatology of periodical fevers, I explained that the difference between the ordinary and the pernicious paroxysm was the more profound depression of the vital affinity in the latter. Owing either to the intensity of the exciting cause (malaria) or some peculiarity of the individual, the depression of that property is so great as to endanger an actual arrest of capillary circulation and molecular changes as they occur in the processes of secretion, nutrition, and disintegration; and hence the extreme danger of actual suspension of life in the paroxysm. Or, if reaction does take place, it is liable to be incomplete, leaving the circulation, molecular changes, and temperature of some of the parts still depressed, even through the intermission. The essential pathology of the pernicious chill therefore is, that the play of vital affinity is so far overcome as to make

the restoration of the natural atomic or molecular relations between the constituents of the blood in the capillaries and the organized tissues extremely difficult. This being the essential feature of the disease, it is necessarily dangerous, because whenever the properties of the tissues become so involved that they lose their inherent power to attract new atoms from the blood and return old ones, as in the natural processes of secretion, nutrition, etc., there is not only imminent danger of the cessation of life, but there is also great difficulty in obtaining any effect from the administration of remedies.

In some cases in which reaction takes place, it is not complete or uniform in all parts of the body and extremities. The parts most frequently left pale and cold after the general reaction, are the fingers, toes, tip of the nose, and lobe of the ear. Such failure in any part, however limited, should be regarded as indicating the return of another and still more dangerous paroxysm.

Owing to the different degrees of intensity in the action of the malarial poison, or to the difference in the susceptibility of the several groups of organs, or to both, the cases classed as pernicious present considerable diversity in their symptoms and progress. For clinical purposes they may all be arranged in five groups, namely: the comatose, the spasmodic, the pulmonary, the choleraic and the algid. This number might be reduced by uniting the first two groups in one, calling it the cerebro-spinal. In the first group here mentioned, the force of the morbid impression falls upon the brain, or more particularly upon the cerebral hemispheres, and so far suspends their function as to render the patient unconscious or comatose from the very beginning of the paroxysm. As these cases progress the coma may become hourly more profound, the face pale, the temperature low, pulse feeble, respiration irregular, and pupils dilated, until death supervenes. Dr. Hertz, in Ziemssen's Cyclopædia, speaks of cases that are not only perfectly unconscious, but have reached a stage of apparent suspension of the functions of life so as to appear dead. He speaks of a man who was actually supposed to be dead, and taken to the morgue for examination; but some signs of life being discovered he was returned to his bed, where subsequent reaction took place and he recovered. Such cases of apparent death are rare. In some of the cases in which a comatose condition presents itself, a partial reaction soon takes place, in which the face becomes deeply suffused, the head and trunk hot, pulse more full, and respiration hurried. In some of these cases the coma gives place to wild delirium, which may end either in the supervention of sleep and an intermission, or the return of coma, general paralysis and death.

For practical or therapeutical purposes it is important to distinguish the cases in which, at least, partial reaction occurs, from those just previously described. The one is accompanied by febrile reaction, with fullness of the cerebral vessels, while the other remains cold, the pulse weak, vacillating and irregular, yet both are comatose. In the second group of cases, which I called *spasmodic*, the force of the disease appears to fall upon the spinal cord and medulla oblongata. In these, the paroxysm is ushered in, not with coma, but with severe muscular contractions, either continuous as in tetanus, or paroxysmal, as in convulsions.

The latter generally occurs in children, while in adults the muscular contractions are more continuous, causing the muscles at the back of the neck and upper part of the spine, on one or both sides to become rigid, retracting the head, and giving the patient much the same aspect as in cerebro-spinal meningitis. A case of this kind, in the person of a young woman, came under my care many years since in the Mercy Hospital. I saw her

first immediately after her admission, when in the paroxysm. She appeared entirely unconscious; the head retracted and turned to the left from rigid contraction of the muscles on the posterior and left side of the neck; face and skin generally congested and bluish; extremities cold; pulse soft and variable in beat; respirations increased in frequency but variable; and pupils nearly natural. As I could get no history of the case I regarded it as one of congestion of the cerebro-spinal centres, and directed treatment accordingly. On returning to the hospital a few hours later, I was surprised to find the patient conscious, the rigid muscles relaxed, the head freely movable, and the patient comparatively comfortable. I then learned sufficient facts concerning the history of the attack to satisfy me that it was altogether of malarial origin, and at once commenced giving 0.33 gram (gr. v) doses of quinine every two hours, and continued until 2.00 grams (gr. xxx) had been taken, when the time was lengthened to six hours. No further paroxysms recurred, and the patient soon recovered. There is much danger in this class of cases that the muscles of respiration may become so involved in the rigid contractions as to suspend the motions of the chest, and of course suspend also the life of the patient.

In the third group of cases the force of the disease, instead of falling upon the brain or spinal cord, is manifested chiefly in the respiratory organs, and the patient, on going into the paroxysm or chill with its general phenomena of depression, feels great oppression across the chest; the breathing becomes laborious, the finger-nails blue, the lips leaden, and the pulse frequent and feeble, with impairment of circulation in the cutaneous surface. While the mind remains clear, though often inclined to drowsiness, the stagnation in the pulmonary capillaries and consequent dyspnœa increases rapidly. At first there is a universal mixture of moist and dry rales passing rapidly into the sub-mucous and mucous rhonchi, all over the chest from the clavicles to the diaphragm, posteriorly and anteriorly.

The accumulation in the lungs is sometimes so rapid that the air cells become literally overwhelmed by compression and œdematous infiltration in three or four hours, shutting the air off so completely that the patient dies directly from suffocation. One case of this kind came under my observation many years ago, that terminated fatally in about eight hours. More recently, in consultation with another physician, I saw a case almost equally rapid in its progress, but which was arrested, and recovery took place.

In the fourth or choleraic group of cases, the force of the disease seems to fall more directly upon the digestive organs, causing in addition to the general depression and coldness, great epigastric distress and restlessness, with frequent turns of vomiting and purging, intense thirst, dryness of the mouth and fauces, coldness and blueness of the surface and extremities, and weakness of voice, constituting a group of symptoms so closely resembling a severe attack of epidemic cholera, that the case would be readily classed as such if the latter disease should happen to be prevailing in the community at the same time. Generally, however, there are less muscular cramps, and the discharges less like rice water in appearance than in cholera. In some of this group of cases, especially in warm climates, and when the pernicious character manifests itself after one or more paroxysms of a milder grade, more or less hæmorrhage accompanies the stage of exhaustion.

I recollect an instance occurring outside of the city limits, twenty years ago, in the latter part of the summer, where a man, past the middle period of life, had a periodical fever for four or five days, accompanied by loose

ness of the bowels, and which ended in a paroxysm of extreme depression, during which he had three or four copious discharges of dark grumous blood, and in less than five hours he was in a state of complete collapse, and soon died, apparently from the direct effects of the hæmorrhage.

Hæmorrhage in these cases may take place from the gums, from the mouth, and from the nasal passages, the renal organs, or into the subcutaneous tissues, just as we see sometimes in malignant cases of the eruptive fevers. I saw, not two weeks since, a case of measles where the disease manifested itself in this malignant form. A general hæmorrhagic tendency was developed so early that on the second day of the eruption there was more or less extravasation into the tissues, and an oozing of blood into the mouth, and the patient died within twenty-four hours from the time I saw her, which was on the evening of the third day of eruption. It was a young woman in the vigorous period of adult life.

A similar pathological condition is occasionally seen in the more malignant cases of all the varieties of idiopathic fever.

I have now described briefly the comatose and the spasmodic cases which involve prominently the cerebro-spinal nervous centres, the pulmonary, or such as endanger life from suspension of the respiratory function, and the choleraic, involving most prominently the digestive organs. The last cases described, accompanied by hæmorrhage, are by most writers, placed in a separate group called the hæmorrhagic. There is another variety still, that is known as pre-eminently the cold or algid group. Primarily all are more or less cold, but there is a class of cases where the patient becomes almost at once cold and blue, and ultimately his organic functions cease without any specific determination to one important organ more than another, unless it be to the cutaneous surface in the form of copious cold sweating. And even the post-mortem examination in these cases reveals nothing more than a paler and drier state of the tissues than natural. When death has taken place in the comatose groups of cases, the post-mortem examination reveals more fullness of the vessels of the brain, with more or less œdematous infiltration into the cerebral substance. In the spasmodic or convulsive group similar appearances are found in the spinal cord or medulla oblongata, or both. In the pulmonary group the predominant post-mortem appearances are passive engorgement of the vessels and œdema of the tissue of the lungs. True hepatization or other inflammatory changes are very seldom seen. In the choleraic groups of cases the chief post-mortem changes are increased fullness of the vessels, with softening of portions of the mucous membrane of the alimentary canal, with a similar condition of the spleen, and, less notably, of the liver.

All these post-mortem changes point directly to certain pathological conditions, such as general impairment of tonicity in the tissues, including especially the coats of the blood-vessels, and ready passive exudations wherever local determinations take place. These are shown by the copious sweating from the skin, the still more copious serous and hæmorrhagic discharges from the internal surfaces, the vascular fullness with œdema of the brain and lungs, and the actual reduction of temperature. In regard to the latter, Dr. Hertz mentions a case in which the clinical thermometer gave only 31° C. (88° F.) in the mouth, 30° C. (86° F.) in the anus, and 28.8° C. (84° F.) in the axilla. Such reduction of temperature, as well as the whole assemblage of changes I have described, clearly indicate a great impairment of tonicity, including muscular contractility, and of molecular changes and innervation.

If these views, sustained alike by clinical observation and post-mortem examinations, are correct, they furnish two leading and important indica-

tions for treatment. First, to bring about general and uniform reaction by the prompt use of such means as will most efficiently increase the tonicity of the tissues, the molecular changes, and the vaso-motor sensibility. If we succeed in this, and thereby conduct the patient safely to the commencement of a period of remission or intermission, the second indication is to bring him, as speedily as possible, so fully under the influence of some anti-periodic as to prevent the supervention of another paroxysm.

In endeavoring to fulfill the first indication, it has been, from the earliest period in the history of the disease, a common practice to endeavor to establish reaction and warmth by administering large doses of hot stimulating remedies internally, and applying all kinds of heating and irritant applications externally. Hot whisky or brandy punch, with or without the addition of pepper, has been given most liberally, with external frictions, sinapisms, hot bricks, hot corn, bottles of hot water, and hot baths, and yet without the slightest beneficial effect on the patient.

Dr. Daniel Drake, in his valuable work on the Topography and Diseases of the Interior Valley of the Continent, states that he has seen the skin made *red* by hot frictions without the slightest effect on the temperature. In one case he saw the patient immersed in a hot bath containing a liberal quantity of salt, mustard and whisky; and in another the patient was enveloped in cloths or sheets wet with an infusion of Peruvian bark as hot as could be borne, and covered with oiled silk to prevent evaporation, but in neither was there any improvement in the circulation or the temperature. And he states as the result of his extensive personal investigations, that both external heat and the internal use of what are called alcoholic stimulants, are absolutely useless in the depression of a true pernicious paroxysm of malarial fever. From what we now know of the effects of alcohol as an anæsthetic to nerve sensibility, and direct retarder of molecular changes and capillary circulation, we should not only expect no benefit, but positive harm from its use in these cases. Under the theory of internal congestion, especially of the portal system of vessels, bleeding, large doses of calomel, and various kinds of emetics have been tried, but with no encouraging results, except in a few cases, when an emetic of salt and mustard appeared to aid in establishing reaction.

Dr. Milne Edwards many years ago demonstrated very clearly, by an ample series of experiments upon the living animal, that heat diminishes the general tonicity and relaxes the contractile tissues of the body, and that cold increases both by bringing the atoms closer together and strengthening the play of vital affinity.

The results obtained by Dr. Edwards have been fully confirmed by later observations; and whether you agree with me that malaria acts directly upon the elementary properties common to all living tissues, or indirectly through a primary paralyzing influence on the vaso-motor nervous system, as suggested by most writers, they point directly to the sudden and temporary application of cold as the most rational and efficient means we possess for arousing nerve sensibility, capillary circulation, molecular movements, and, as a result, an increase of temperature. I have repeatedly seen this power efficiently displayed in the treatment of cases of opium poisoning. In the case of a little child to whom the mother had given an overdose of laudanum by mistake, I was called in the middle of the night, and as I entered the room the child appeared to be breathing out its last gasp. I immediately caught a cup of cold water and suddenly dashed a part of it on the child's face and chest, which aroused two or three quick and full inspirations, followed by shorter and shorter ones, until another apparent stop; another dash of cold water renewed them, and for more

than three hours I sat by the child repeating the dash as often as the respiratory movements failed, during which the poison was so far eliminated and the nervous sensibility restored that it was safe to leave the patient.

In using the dash of cold water for the purpose of establishing general reaction from the cold stage of pernicious fever, the patient should be stripped, and several gallons of cold water suddenly dashed over the head and trunk of the body, then quickly rolled up in warm dry flannel blankets for thirty minutes. If there is not a decided improvement in the pulse and temperature at the end of that time, unwrap him and repeat the dash, following it by the warm blankets as before. This process may be repeated three or four times, if necessary, but in most of the instances in which it has been tried, one or two repetitions have been sufficient. I do not recommend to you this method of treating the pernicious chill on mere theoretical grounds, for it has had the sanction of direct clinical experience. So early as 1830, Dr. Fearn, of Huntsville, Alabama, one of the most eminent and successful practitioners in the Southern States at that time, adopted the practice with such success as to attract much attention and to win many followers in the South. He was residing in the belt of country most favorable for the development of this variety of malarial fever, and at a period of time when it was much more prevalent than it has been in later years. Only two cases have come directly under my observation in which the practice was adopted, and in both the result was favorable. One of these occurred more than twenty years since. The patient was a young woman in a family of hydropathic faith, and when they were told by the attending physician, and myself in consultation, that the patient might not live until morning, they took the case into their own hands, wrapped her in cold wet sheets for a pack nearly half an hour, then changed to warm dry blankets, from which time she began to improve, and in less than eight hours she had safely entered the stage of intermission.

Very recently, Dr. J. P. Davidson, of New Orleans, in a valuable paper read to the New Orleans Medical and Surgical Association, on Pernicious Fever, has added his testimony in favor of the cold douche in the most emphatic manner.*

While I have no doubt but that the sudden and alternate application of the dash of cold water and dry warmth constitutes one of the most efficient methods of establishing reaction, there are other remedies of real value, especially in some of the groups of cases I have described, and which may be used either alone or in conjunction with the process just indicated. For instance, in those cases of the comatose variety where a partial reaction has taken place and the face is deeply flushed and the head hot, apply an ice cap to the head and back of the neck. In other cases, where they are equally comatose but pale and cool, instead of the ice cap bring the patient's head over a tub, and with a pitcher filled with tepid water pour a douche of two or three quarts of water over the occiput, repeating it once in from half an hour to an hour, and it will constitute one of the most efficacious means of relief. The same means are

*See Paper on Pernicious Fever, by J. P. Davidson M. D., in the New Orleans Medical and Surgical Journal for February, 1880. On pages 756 and 757, Dr. Davidson uses the following language: "In cases of the algid form of the disease, in which the symptoms of collapse manifest themselves early, I know of no plan of treatment calculated to meet the exigencies of the case equal to the cold douche." * * * * "No time is to be lost in relieving the patient of the lesion of innervation and bringing about reaction. Delay in experimenting with stimulants, sinapisms, frictions, etc., is time thrown away, and will commonly disappoint the expectations of the physician. While the depressed condition of the heart's action continues, with the serum of the blood exuding through the paralyzed capillaries of the whole mucous lining of the bowels, and the copious transudation through the skin, exhausting the patient, and deepening the collapse, calorification is difficult to restore; all means, therefore, of arousing the energies of the nervous system short of the shock produced by the cold douche, properly administered, will avail but little."

applicable to the neck and spine, in the group of cases described as spasmodic or convulsive, and to the chest in those cases where the lungs are involved. In the choleraic cases, accompanied by great restlessness, frequent vomiting and purging, with cold sweat, much collateral advantage may be gained by the judicious use of morphia and atropia hypodermically. If the heart's action is very feeble the injection of morphia and atropia may be alternated with suitable doses of strychnia. In the purely algid cases, as I have described them, in addition to the efficient application alternately of cold water and dry warmth, the prompt administration, either by the stomach or hypodermically, of strychnia and atropia, without morphine, will constitute the best treatment you can adopt.

Atropia is one of the most reliable remedies we have for checking excessive perspiration and increasing the blood in the peripheral capillaries, while strychnia is equally efficient in increasing muscular contractility, and thus strengthening the heart.

If, by the means I have detailed, or any other, the reaction is established, and the patient approaches the period of intermission or remission, how can we fulfill the second indication I have named, and most certainly prevent another paroxysm? I answer, by bringing the patient as rapidly as possible under the full influence of sulphate of quinia, which is very generally conceded to be more reliable for this purpose than any other remedy in the materia medica. For accomplishing this, 1.0 to 1.3 grams (gr. xv to xx) of quinine should be given at once by the mouth, and the same quantity repeated at such intervals that three doses will be taken before the time for commencing another paroxysm. If the stomach rejects the remedy by vomiting, 2.0 grams (gr. xxx) may be given in the form of enema, and repeated at the same intervals, as if given by the mouth; or from 0.5 to 0.6 grams (gr. viii to x) may be used hypodermically, and repeated as by the other methods. Nearly the same quantities should be administered the second day, and one-half as much the third; after which ordinary doses with rest and proper nourishment, will complete the convalescence. Many have recommended much larger doses of the quinine than I have indicated, some giving from 2.0 to 4.0 grams (gr. xxx to lx) at a dose, and repeating until 8.0 grams (℥ii) or more, have been taken in from twelve to twenty-four hours. Such doses, however, have produced complete loss of both sight and hearing in some cases, and in others, the death of the patient; and I believe them to be wholly unnecessary. All attacks of pernicious fever leave the patient much debilitated, and hence proper caution should be exercised in regard to both mental and physical exercise until health and strength are fully restored.

Malarial Hæmaturia or Hæmorrhagic Malarial Fever.—During the last twenty years a form of malarial fever has been met with, more especially in the States bordering on the Lower Mississippi and the Gulf of Mexico, characterized by a chill, unusually severe nausea and vomiting, very rapid development of a deep yellow color, hæmorrhage from the kidneys and bladder, with dangerous prostration. Cases of the same form have, doubtless, been met with in former times and in other countries, but did not attract special attention until fully described by Drs. Michel, Osborn, Ghent, Barnes, Davidson, and others in the Southern States, and more recently by Dr. Bérenger-Féraud, as it appeared in Senegambia and Cochin China. In the Southern States it has prevailed chiefly in the winter or cold and rainy season of the year. It generally attacks persons who have already become anemic from previous malarial attacks, and is often immediately preceded by three or four paroxysms of ordinary inter-

mittent fever.* The discharge of very dark bloody urine commences almost immediately after the initial chill; the matters vomited and purged are copious in quantity, almost as black as tar from the intermixture of bile, and often change to a deep green after exposure to the light and air. They contain no blood. The tongue is generally coated; pulse is quick and weak; temperature varies from 37° to 40° C. (99° to 104° F.) and the discharge of blood with the urine continues until, in many of the cases, fatal collapse ensues. The duration of the disease may vary from twelve hours to as many days.

The prognosis is very unfavorable.

Post-mortem examinations show no structural changes specially characteristic of this variety of malarial fever. The stomach generally contains a dark fluid mixed with altered bile; its mucous membrane is injected with blood and more or less tumefied; the spleen and kidneys much enlarged from vascular-congestion, and the latter from hæmorrhagic exudation.

Treatment.—The chief indications for treatment in these cases are, to arrest the progress of the general fever; stop the hæmaturia, and restore the natural secretory action of the liver and kidneys. For accomplishing the two first objects, large doses of quinine, opium, and ordinary astringents, have been frequently used, but with very little success; indeed, the opium and pure astringents are more likely to cause suppression of urine and favor uræmic poisoning than they are to do good.

The use of the sulphite or hyposulphite of soda in full doses, is very strongly recommended by Dr. F. C. Fahs, of Alabama, and Dr. G. B. Malone, of Arkansas. The latter claims to have treated forty-four cases without a single death. He gives 2 grams (gr. xxx) of the hyposulphite of sodium, and 4 cubic centimeters (fl. ʒi.) of fluid extract of buchu dissolved in 30 cubic centimeters (fl. ʒi.) of water, and repeats the dose every three hours until the disease is arrested. While the hyposulphite is being administered to arrest the general disease, the hæmorrhage from the congested and partially paralyzed renal vessels may be most effectually checked and the natural secretion promoted, by giving between the doses of the hyposulphite, 4 cubic centimeters (fl. ʒi.) of spirits of nitre and 0.33 cubic centimeters (min. v) of oil of turpentine in a little sweetened water. In the beginning of the treatment if the vomiting is persistent, allowing the patient to drink freely of cold water until the efforts at vomiting cease, has been found beneficial. The use of small and frequently repeated doses of fresh buttermilk or milk whey, through the whole course of the disease, will aid in improving the renal secretion and nourishing the patient. After the paroxysms of fever and the hæmaturia have been fairly arrested, and the hepatic, renal, and intestinal secretions restored, the patient may be put upon the same tonics and nutrients as I have already recommended during convalescence from other varieties of malarial fever.

Typho-Malarial Fever.—As I explained fully when discussing the subject of typhoid fever, there are many localities in which the causes of both continued and periodical fevers exist at the same time, and are consequently exerting their influence upon the human system conjointly. The result is, not the production of a separate and distinct form of fever, to be designated typho-malarial; but simply an intermingling of the symptoms and pathological changes of the two types of fever in the same

* Dr. Michel, of Alabama, describes the disease as "a malignant malarial fever, following repeated attacks of intermittent, characterized by intense nausea and vomiting, very rapid and complete jaundiced condition of the surface, as well as most of the internal organs of the body, an impacted gall bladder and hæmorrhage from the kidneys."

patient. The symptoms and general progress of such cases are sufficiently considered in the 11th lecture of the present course.* The correct view is to regard the cases of fever occurring under such influences as mixed or complicated fevers. If the malarial element predominates, the case will be one of periodical fever, complicated by typhoid symptoms and tendencies. If the causes of typhoid predominate, the case will be true typhoid fever, complicated with symptoms of malarial influence. It is of much practical importance that the physician should recognize the true character of all such cases, and use conjointly the proper remedies for both, instead of trying to relieve one class of symptoms before prescribing for the other. Moderate anti-periodic doses of quinine should be promptly given and repeated until the symptoms produced by the malarious element are removed, and at the same time the pathological changes of the typhoid class may be checked and ultimately overcome by the administration of 0.8 cubic centimeters (min. xii) of the aqueous solution of iodine every four or six hours.† In the middle and later stages of each case, such additional remedies should be given as the development of local symptoms may indicate. These have been fully detailed in previous lectures, and need not be repeated here.

LECTURE XXIII.

Eruptive Fevers—Their Names, History, Causes, Pathology and Anatomical Characteristics.

GENTLEMEN:—I come now to the consideration of the third, and last group, or subdivision, of the acute general diseases.

This group is called *eruptive fevers*, for the reason that each disease properly included in the group, is characterized at a certain stage of its progress by the appearance upon the cutaneous surface of an eruption of a uniform character, and bearing a certain relation to the progress of the general disease. The diseases included under this head are, variola with its modifications, varioloid and vaccina; varicella and sudamina; scarlatina; rubeola; rötheln; roseola; and miliaria. To these I shall add parotitis contagiosa or mumps, and pertussis or whooping-cough, for though neither of them have any characteristic eruption upon the surface, both present so many circumstances analagous to those accompanying the true eruptive fevers, that they can be more properly considered in this connection than elsewhere.

History.—All these diseases have been known and described from the earliest period of medical history, although not accurately differentiated as separate diseases until the latter part of the eighteenth century. They were generally classed together as *acute exanthems*. Variola or smallpox, was, perhaps, the first to receive a separate recognition, having been traced in China and India to a very early period of time. It is not certain that it was known among the ancient Greeks and Romans, but was introduced into Europe through the Arabians during the sixth century of

*See pp. 90-91 of this volume.
†See formula on page 151.

the Christian era. From that time to the introduction of vaccination in the latter part of the eighteenth century, it repeatedly spread over the larger part of Europe in severe epidemic form, and soon became one of the most dreaded of all the diseases that scourge the human race. During the same period of time the scarlet fever, measles, diphtheria, and rötheln, were included together under the names of cynanche or angina, and in the aggregate proved but little less destructive to life than the variola. Prior to the practice of vaccination by Dr. Jenner, the best English authorities estimate that the average annual mortality from variola in Europe was not less than 210,000, and in Great Britain and Ireland, at least 45,000. If you add to these figures the average annual mortality from the scarlet fever and other members of the group, you will have a better idea, both of the importance of these several diseases, and of the value of vaccination and other prophylactic and sanitary measures, adopted for their prevention.

Causes.—All the diseases I have named as belonging to the class of eruptive fevers, except roseola, sudamina, and miliaria, arise directly from specific contagiums or viruses, reproduced in the bodies of the sick, and communicable from one individual to another, either by inhalation of an infected atmosphere or by inoculation. Other influences may increase the susceptibility of the individual to the action of the specific poison, or may impair his power of resistence when attacked, and thereby act the part of predisposing agents. The protracted influence of cold and dampness appears to favor the prevalence of these affections, as they are generally more prevalent during the cold season, including the spring and autumn, than in the summer.

Such atmospheric impurities as are produced by neglect of ventilation and cleanliness, also favor their spread, and increase their fatality. But the most efficient of all the predisposing influences is that mysterious atmospheric condition called the "epidemic constitution," which occurs at variable periods of time, and during which they exhibit a persistency in the disposition to spread, and to search out the unprotected members of the community far more actively than during the years between these special epidemic periods.

Aside, however, from all predisposing causes, each of the diseases under consideration has its own specific exciting cause, which evidently consists of a contagious organic substance or virus, elaborated in the bodies of the sick; and in some of them, as the variola, vaccina, and varicella, capable of isolation and examination. In the three diseases just named, the virus collects in fluid form, during the active progress of each disease, in vesicles and pustules in the skin, from which an abundance can be obtained for examination and analysis, both chemically and microscopically. In the exanthematous members of this group, namely, the scarlatina, rubeola and rötheln, the specific contagium also produces more or less inflammation in the skin, but does not collect in fluid form in visible vesicles or pustules, but is eliminated with the exhalations from the skin and mucous membrane of the air passages. That each has a specific virus, and that it exists in the blood during the active progress of the symptoms, is proved, however, not only by the contagiousness of the emanations just mentioned, but by the ability to reproduce the disease by inoculating well persons with the blood of those who are sick.

Microscopic examinations have revealed the existence of minute organic germs in the blood of all these contagious eruptive diseases, and in the virus or lymph that collects in the vesicles and pustules of variola, varicella, etc.; but the germs thus discovered do not differ in any appreciable degree from the bacteria and micrococci, found under many other condi-

tions having no connection with these diseases. Consequently there is no evidence that these organic germs constitute the active contagiums on which these several diseases depend for their existence and propagation. On the contrary, there are some facts which bear strongly against such an inference. It is well known that the emanations from the skin and lungs of patients affected with any of the diseases under consideration, are sufficiently impregnated with the specific contagious material to communicate the disease to others who may chance to breathe the air of a room containing such emanations. Yet no one, I think, has been able to detect any germs in the exhalations from the skin and lungs of those sick, that were not found equally numerous in the exhalations from the same sources in persons enjoying good health. In the latter part of the year 1870, the late Dr. F. H. Davis, of this city, instituted a series of observations on the exhalations of patients laboring under typhoid fever, diphtheria, erysipelas, scarlatina and rubeola. The organic materials in the atmosphere of the sick room, in the breath exhaled, etc., were collected on clean glass slides, moistened with pure glycerine, and submitted to thorough microscopic examination. The results were given in his inaugural theses in March, 1871. He found an abundance of dust particles and a variety of organic atoms, but nothing whatever that he did not find equally abundant on the slides exposed in the same way to the breath and the air of rooms occupied by persons in good health.* It is highly probable, therefore, that the true contagium does not consist of bacteria or any other living germs, but of a subtle fluid impregnating the serum of the blood, capable of collecting with such serum in vesicles and pustules, and of being exhaled with the aqueous vapor from the skin and lungs, and possibly with all the excretions from the bodies of the sick. But whatever may be the form of the several specific contagiums that give rise to the eruptive fevers, the laws that govern their action upon the human system are more definitely ascertained, and are of great practical importance. When introduced into the human system, whether by inoculation, inhalation, or any other method, they require a certain period of time, either for self-multiplication or for effecting certain changes in the quality of the blood, probably for both, before any appreciable effects are produced upon the functions of the body. The time thus required is called the period of incubation. Its length is not the same in all of these affections, but varies from an average of five days in scarlet fever, to twelve or fourteen days in variola.

The period of incubation having passed, they all present evidence of possessing active irritative qualities sufficient to induce the rapid development of a high grade of general fever, which continues from two to four days before the characteristic eruptions appear upon the cutaneous surface. This is called the period of primary or premonitory fever. The eruption in each disease presents a definite stage of increase, maturity, and decline, which together constitute the period of eruption. At the end of the period of eruption, convalescence ensues, unless it is postponed by the severity of such local complications as are liable to occur in nearly all these varieties of fever.

You perceive, therefore, that the events following the introduction of any one of these specific poisons, succeed each other in a definite order, each event occupying a definite period of time, accompanied by distinctive symptoms, and ending spontaneously in convalescence.

The diseases they produce are, therefore, strictly self-limited in duration, and one attack, as a rule, permanently destroys the susceptibility of

*See Chicago Medical Examiner, Vol. xii, pp. 197-8.

the system to future attacks of the same disease. With the exception of variola, all the diseases under consideration occur far more frequently in childhood and youth, than at any later period of life, yet no age is entirely exempt from liability to an attack. Neither sex nor nationality appear to exert any influence over the susceptibility to this class of diseases.

Pathology.—What I have been stating to you concerning the efficient causes of eruptive fevers, leads naturally to an inquiry into their general pathology, or the nature of the morbid processes that take place during the successive stages of their progress. That the specific contagium, however small the quantity primarily introduced, enters the blood and there undergoes an increase more or less rapid during the period of incubation, is undoubtedly true. That it circulates with the blood throughout all the living structures, and when sufficiently developed, produces a direct irritative effect, thereby morbidly exalting the susceptibility and disturbing the vital affinity in such a way as to pervert the molecular changes concerned in nutrition, disintegration and secretion, coincidently with disturbance of innervation and temperature, is clearly evident from the uniform establishment of general irritative fever prior to the appearance of any local inflammations in the skin or elsewhere.

Yet a careful clinical study of the symptoms characterizing the further progress of each case, shows that, in addition to this general irritative action, the exciting cause or poison possesses a special affinity for the cutaneous tissue and certain parts of the mucous membrane of the respiratory passages, causing it to accumulate therein with greater or less rapidity, and to establish at each point of accumulation an inflammation of a grade peculiar to itself. In the ordinary cases of variola, varioloid and varicella, the accumulation of these poisons in the cutaneous tissue, is so rapid that by the third or fourth day, the blood has become free from their presence, and consequently the general fever subsides coincidently with the appearance of the eruption, or points of local inflammation on the surface; and if any renewal of fever takes place during the subsequent progress of the case, it results from the extent and intensity of the local inflammations, and not from the action of the primary poison in the blood. In scarlatina, rubeola and rötheln, the exciting cause or contagium is attracted to the cutaneous tissue less rapidly, and the blood does not become free from the poison until the cutaneous and other local inflammations have reached their climax, which is from three to five days after they first become visible. Consequently, the general fever, instead of ceasing at the time of the first appearance of the points of inflammation on the surface, as in variola, continues unabated until such local inflammations or efflorescences have reached their full maturity, and then both decline together, accompanied by a more or less complete exfoliation of the cuticle, and leaving the system free from the specific poison. The contagiums of variola and varicella manifest very little affinity for, or tendency to find lodgments in, any other than the cutaneous structure. A few points of lodgment and consequently of pustular or vesicular inflammation are seen in the mucous membrane lining the mouth and fauces in a large proportion of the cases. They appear at the same time and pass through the same stages as the eruption on the surface. But the contagiums of scarlatina and rötheln manifest quite as much affinity for the mucous membrane of the fauces, pharynx and nostrils, with the contiguous glands, as for the cutaneous tissue; and in many cases establish in these parts a dangerous degree of inflammation; while that of rubeola selects for its special lodgment and irritative action, the mucous membrane of the nostrils, trachea, and larger bronchial tubes, in addition to the skin.

In a large majority of the cases of all varieties of eruptive fever, the quantity and quality of the contagium developed in the system of the patient is such that the whole of it finds first lodgment in, and subsequently complete exit through, the surfaces I have mentioned, and an early convalescence is established. In a smaller number the quantity or quality of the poison is such that the extent and intensity of the inflammation in the skin, fauces, and glands of the neck, may be sufficient to endanger the life of the patient, as in confluent variola and anginose scarlatina. In a still smaller number of cases, owing either to the quantity and quality of the poison, or to some prior defect in the properties of the tissues, the specific poison fails to impinge or find complete lodgment in the cutaneous and other tissues I have named, consequently a large part of it remains in the blood, not only perpetuating the general fever, but causing so rapid an impairment of the quality of the blood itself as to speedily endanger the life of the patient. These constitute the class of cases usually called malignant. You thus see that we may have three groups of cases in each of the eruptive fevers, namely, the simple, the intensely inflammatory, and the malignant. In reference to variola, authors designate the first of these groups as distinct, or discrete small-pox; the second as confluent, and the third as malignant. In reference to scarlatina, the cases in the first group are called scarlatina simplex; those in the second, scarlatina anginosa; and those in the third scarlatina maligna. The cases belonging to the first group of all the varieties of eruptive fever, uniformly tend to convalescence and early recovery. Those classed in the second group tend towards recovery or death, in proportion to the extent and intensity of the local inflammations, and the prior constitutional condition of the patient. In variola, for instance, the number of points of local inflammation or pustules on the surface, may be so great that in the progress of development they touch margins, and become continuous, one with another, over a very large part of the cutaneous surface, causing them to be termed *confluent* cases. The secondary fever and copiousness of the suppurative process are sufficient, in many of these cases, to produce fatal exhaustion before the suppurative stage is completed. Another source of danger in these cases is the absorption of septic matter from the suppurative surfaces, the re-poisoning of the blood, and the consequent rapid and fatal exhaustion of the patient. If, however, the confluence of the pustules is not general, but limited mostly to the face and hands, and the constitutional condition of the patient is good, the tendency will be towards recovery. In scarlatina the cases included in the second group will be dangerous to life, in proportion to the extent and intensity of the inflammation of the fauces, tonsils and glands of the neck. The swelling of these parts may be sufficient to so obstruct both respiration and deglutition as to cause a fatal result during the first three or four days. Or, with less tumefaction, there may follow such a degree of ulceration and persistent suppurative action in the fauces, nostrils, etc., as to cause a slower but none the less fatal degree of exhaustion. There are many cases, however, belonging to this group, in which the local inflammation is less severe, the ulcerations limited, and sufficient nourishment can be taken to sustain the strength of the patient until convalescence ensues. The cases included in the malignant group of eruptive fevers, are those in which the specific cause accumulates in the blood to such a degree that the latter is incapable of maintaining the mutual relations between it and the several structures of the body; consequently the tonicity of the latter becomes rapidly impaired, molecular changes fail, nervous sensibility is blunted, and all the phenomena of life soon cease. In many of these

cases petechial or hæmorrhagic exudations and hæmorrhages precede the fatal result. By attempting to classify all cases of eruptive fever into the three groups I have named, you must not infer that there is any well defined or broad line of difference separating these groups. On the contrary, at the bed-side, you will find the severer cases of the first group so closely approximating the milder ones of the second, that you will often be in doubt as to whether you should assign a given case to one or the other. The same is true if you compare the most severe cases included in the second group with the least malignant of those in the third. Having explained, as fully as practicable, the views I entertain concerning the causes, pathological conditions, and tendencies of those acute general diseases classed as eruptive fevers, I will next direct your attention to the anatomical characters or structural changes belonging to each.

Anatomical Characteristics.—The most constant and distinctive anatomical or structural lesions found in these fevers, are developed on the cutaneous surface in the form of eruptions.

These eruptions are presented in three distinct primary forms, each form having its own structural peculiarities, and its own modes of further development. The first form is primarily a papule or small hard pimple between the cuticle and cutis vera, sufficiently elevated to be readily detected by the touch, and on the apex of which may be seen a minute vesicle filled with transparent serum or lymph. These, at a certain stage of their progress, become inflamed and suppurate, by which the serum they contain is changed to a purulent fluid, the hard base much increased in circumference, the vesicle flattened and depressed or umbilicated in the center, constituting a mature pustule. The fevers characterized by this form of eruption are the variola, varioloid, and vaccine.

The second is that of a true vesicle produced by sufficient inflammation at a given point in the cutis vera to cause an exudation of serum and elevation of the cuticle into a transparent vesicle, larger in circumference and without the hard base that belongs to the pustule. The only eruptive fevers charactered by this vesicular form of eruption are the varicella and sudamina.

The third appears in the form of small red points or spots, without the hard elevation belonging to the first variety, or the vesicle of the second. There is no exudation of serum sufficient to elevate the cuticle, nor suppuration, in any part of their progress. Remaining as simple red points or spots throughout their course, they are called exanthems, or more popularly *the rash*. They may be pretty uniformly diffused over the surface and so numerous as to cause general redness, as in scarlatina; or they may be aggregated in clusters, leaving the intervening parts of the skin natural as in rubeola. The fevers characterized by this form of eruption are scarlatina, rubeola, rötheln, roseola, and miliaria; hence they are properly styled acute exanthematous diseases, as distinguished from those I have named as vesicular and pustular.

An accurate knowledge of the special characters of each of these forms of eruption is of much importance as an aid in the diagnosis of the several diseases in which they occur.

The pustule commences by simple congestion or accumulation of blood in the capillaries of the papillæ of the corion in a very small spot of the skin. This is quickly followed by exudation of minute specks of serum in the connective tissue and swelling of the epithelial cells of the rete Malpighii. It is this exudation and enlargement of cells that causes the hard elevation or distinct papule; and it is simply an increase of the serum or lymph that elevates the cuticle and gives the appearance of a minute

vesicle on the apex of the papule. The two essential features of the pustule, namely, the papular or hardened base and the superimposed vesicle, having so far developed as to become plainly recognizable by the eye and the touch, both continue to increase in size, and pass through the stages of suppuration to maturity, and desiccation with cicatrization and a return to health.

The vesicle commences like the pustule with a simple primary congestion of the capillaries of the papillæ at a point in the skin, but without sufficient swelling of the epithelial cells to cause an elevated and hard base, while the serous exudation accumulates more rapidly, and separating the cuticle from the cutis vera, presents at once a well formed vesicle filled with clear lymph, which subsequently becomes turbid but not purulent. The exanthem consists of the same primary congestion of the capillaries of the papillæ of the corion, causing small red points, but without the enlargement of the epithelial cells of the pustule, and without sufficient exudation of serum or lymph to elevate the cuticle into a vesicle; consequently there is neither lymph nor pus visible during any part of their progress. Yet there is sufficient disturbance of the connection between the cuticle and the vascular structure beneath, to cause a general exfoliation of the former at the commencement of convalescence.

Whatever anatomical or structural changes may be found in the internal organs and structures, after death from any one of the eruptive fevers, will be the result of local inflammatory complications, and not in any degree characteristic of the general disease. Evidences of such local inflammatory complications are most frequently found in the mucous membrane of the respiratory passages, fauces and glands of the neck, kidneys, and parenchyma of the lungs. In the malignant cases, the blood is found in a condition closely resembling the state of that fluid in the more severe cases of typhoid and typhus fevers.

General Principles of Treatment.—If the views I have expressed concerning the etiology and general pathology of this group of diseases, are correct, they point to certain general principles of therapeutic management of much practical importance. 1st. The existence, in all these fevers, of an incubative stage, during which the minute quantity of the contagium primarily imbibed, is presumed to be undergoing development or multiplication, suggests the question whether it is not possible to introduce into the blood enough of some efficient antiseptic to *prevent* such multiplication, on the same principle of action that the presence of a certain quantity of the sulphite of calcium in a cask of sweet cider or other fermentable liquid, prevents the fermenting process for an indefinite period of time. The antiseptics most likely to effect this object are the sulphites or hyposulphites of sodium, calcium, or magnesium; both on account of their known efficacy in preventing fermentation, and the safety of using them in sufficient doses to more freely impregnate the blood than can be done with most of the remedies belonging to the same class. The opportunities for testing the value of remedies in this stage are not frequent, as the physician is seldom consulted until active symptoms of disease have appeared. When it does happen that an individual comes under the care of a physician soon after fair exposure to one of these contagiums, the antiseptic is given freely through the whole incubative stage and no active symptoms of disease follow, there are left two points of uncertainty. First, the possibility that none of the contagium was imbibed at the time of exposure; and second, the insusceptibility of the individual to its action from other causes. Observation has long since shown that many children do not take the eruptive fevers of the exanthe-

matous variety when fully exposed to contact with them, while the very general practice of vaccination interferes with the results of other tests as applied to variola. In regard to the latter disease, three cases have come under my observation, affording apparently fair opportunities for testing the efficacy of the hyposulphite of sodium. The first of these occurred as early as 1856, and the last one was only one year since. All the three cases were nursing children, belonging to mothers who had direct care of unmodified small-pox, the babies remaining in the room and often lying on the bed with the sick through the whole course of the disease. Two of these were cases in which the father was attacked with the variola, and the other in which a daughter, eighteen years of age, had the disease. In each case, the mothers having nursing babies varying from four to eight months old, and never vaccinated, insisted on taking personal care of the sick member of their families. As the little nurslings had been fully exposed before I saw them, I thought it better to comply with the wishes of their mothers. I immediately vaccinated each one as it came under my notice, and at the same time commenced giving it a solution of the hyposulphite of sodium in mint water, four times a day. The first vaccination did not take and it was repeated a second and a third time, but with no effect whatever. In the last case, one of the vaccinations was done by a medical officer sent from the city health office. The internal use of the hyposulphite of sodium was continued in each of these cases, not only during the ordinary period of incubation, but during the whole time they remained exposed to the respective cases of variola. Neither of these nursing children showed any signs of being affected by either the vaccine or the variola.

Of course these three cases are not enough to justify me in stating anything more than the simple facts.

After the incubative stage is passed and the virus or contagium is fully developed, as shown by the supervention of active febrile symptoms, there remains the same indication for the administration of such remedies as might be capable of neutralizing or destroying the noxious agent in the blood, and thereby rendering the further progress of the disease abortive. There is an important difference, however, between the prevention of the multiplication of an organic poison by the presence and catalytic action of some antiseptic remedy during the period of incubation, and the destruction or neutralization of such poison after the quantity has already become sufficient to induce active morbid phenomena. To accomplish the latter would require a much stronger impregnation of the blood with the antiseptic than is found practicable or compatible with the safety of the patient. It does not follow as a necessary inference, that, because safe doses of efficient antiseptics will not wholly neutralize the poison and render the disease abortive, they are of no value in the treatment of this class of contagious diseases. On the contrary, my own clinical experience has led me to think that when the administration of some of this class of remedies is commenced with the beginning of active symptoms, they may destroy so much of the poison as to materially lessen the severity of the case, as I shall state more fully when I come to speak of the treatment of each disease separately.

2nd. Admitting that we have no reliable remedies for fulfilling the object just stated, the next rational indication is, to adopt such measures and give such remedies as will lessen the irritative action of those contagiums on the living structures and aid in effecting their elimination. When, at the commencement of active symptoms, the temperature rises rapidly with corresponding increase in the activity of respiration and circulation, fre-

quent sponging of the surface with milk-warm water, and the internal use of such doses of veratrum viride or aconite in connection with spirits of nitrous ether or liquor ammonii acetatis, as will moderate the force and frequency of the action of the heart and favor increased eliminations from the skin and kidneys, will lessen much the suffering and restlessness of the patient, and favorably modify the progress of the disease. You must keep constantly in mind the fact that these specific poisons have a natural tendency to accumulation in the cutaneous textures, and that their final elimination is chiefly through this surface, aided, perhaps, by the kidneys and the mucous membrane lining the first part of the respiratory passages. Consequently, all cathartics or other actively evacuant measures calculated to divert the circulation from the surface should be avoided during the premonitory fever, and only the milder laxatives used even after the eruptions are well established on the surface.

3d. A third indication to be fulfilled in many of the cases, more especially of variola and scarlatina, is to lessen the severity and mitigate the effects of the local inflammations which accompany them. As I have already explained to you, a large proportion of the deaths from variola result from the exhausting influence of the suppurative stage in the confluent cases; while a still larger proportion of the deaths from scarlatina are the result of the local inflammations and obstructions in the fauces, nostrils and glands of the neck. Two influences are needed in the management of these local affections; one calculated to lessen the amount of the local morbid actions while they are developing; the other to sustain the important functions, especially those of nutrition and repair, until convalescence is established.

If, as I have already suggested, the extent and severity of the local developments of disease in all the eruptive fevers depend on the quantity and activity of the specific contagium developed during the periods of incubation and primary fever; then so far as we can succeed in fulfilling the first and second indications I have pointed out, just so far will we be lessening the cause of the local affections, and thereby accomplishing the first part of this third indication. The second part is to be accomplished by securing for the patient as good pure air as possible, the faithful use of such nourishment as is most easily converted into the nutrient elements of the blood, and the administration of such tonics as are best adapted to each case.

4th. The last indication which should claim your attention is to guard your patients against the development of those important sequelæ that are so well known as liable to occur during the convalescence from some of these fevers. If you study carefully the immediate causes of these several sequelæ in connection with the hereditary and constitutional tendencies of each patient, you will often find it far easier, by timely attention and advice, to prevent their development, than to cure them after they are established.

Having now considered the causes and general pathology of this third group of acute general diseases, together with the general indications and principles that should occupy our attention and guide us in their management, we are better prepared to enter directly upon the consideration of the symptoms or clinical history, diagnosis and special treatment of each member of the group.

LECTURE XXIV.

Variola, Varioloid, and Vaccine—Their Symptoms, Diagnosis, Prognosis, Special Treatment, and Prophylaxis.

GENTLEMEN: Although variola, or small-pox, has been deprived of much of that power to destroy human life, which it so frequently manifested before the discovery and practice of vaccination, yet it perpetuates its existence, and is still a terror to all classes of the people. Its history, causes, pathology, and anatomical characteristics were sufficiently explained in the preceding lecture, consequently I shall proceed directly to a description of its symptoms and progress as presented at the bed-side in the different stages of the disease.

Symptoms.—After a riod of incubation varying from nine to fourteen days, the active symptoms of variola usually commence abruptly by a chill of varying degrees of severity, from mere chilliness to a severe chill of half an hour or more in duration; accompanied by severe pain in the loins; small, variable pulse; paleness of features; oppression or distress in the epigastrium, and sometimes vomiting. The cold stage soon gives place to increased heat; flushed face; a full and frequent pulse; accelerated respiration; heat and dryness of the skin; a white fur on the tongue; scanty and high-colored urine; very severe pain in the lumbar portion of the back; general aching of the head, back, and limbs, with more distress in the epigastrium and frequent efforts at vomiting. There is also much thirst and general restlessness, with more or less delirium in the severer class of cases.

The symptoms of the initial stage, you perceive, are nearly the same as those which characterize the first stage of all active fevers. The temperature of the body increases rapidly, in many cases reaching from 40° to 41° C. (104° to 106° F.) during the second and third days. There is usually but little variation or abatement of the febrile phenomena until a few hours before the commencement of visible eruptions upon the surface. There may be a slight remission or decrease of temperature each morning compared with the evening, and temporary appearances of moisture on the skin at irregular intervals. The first appearance of eruption is usually on the evening of the third or the morning of the fourth day after the initial chilliness, and consists, at first, of small red spots or points a little elevated and distinctly hard to the touch. In a few hours the little hard papule becomes more elevated and pointed, and a minute vesicle containing transparent lymph, or serum, may be seen at its apex. A few hours before the eruption becomes visible the patient begins to be less restless, and often falls asleep. The temperature, which had reached its climax about the middle of the third day, declines so rapidly as to reach the natural standard in all cases of moderate severity at the end of the fourth day, with a corresponding subsidence of all the other febrile symptoms. In all such cases the patient remains quite free from active symptoms for three days, or until the morning of the seventh day from the initial symptoms, when active inflammation in the pustules becomes apparent, and the temperature again rises to 38° or 39° C. (101° or 102.5° F.) with moderate restlessness, some thirst, and increase of frequency in the pulse,

but without the pains in the back and head that marked the first stage. This renewal of fever, caused by the inflammation attending the progress of the eruption, continues until the suppurative process is completed, which is from the tenth to the twelfth day after the commencement of active symptoms, when the temperature again falls rapidly to near the natural standard, and remains there until the process of desiccation is completed and convalescence established. In the more severely confluent cases, during the primary fever there is a greater degree of distress in the epigastrium, with more persistent and severe vomiting; more frequent and smaller pulse, and more decided delirium; and when the eruption appears the temperature and other active symptoms subside more slowly, not reaching the natural standard of temperature until the end of the fifth day. In such severe cases the secondary fever is also renewed with greater intensity from the seventh to the eighth day, and usually continues until the eleventh or twelfth, when the suppurative stage is completed, and if the patient survives, the process of desiccation commences, attended by a rapid decline of all the febrile phenomena. In many of the more severely confluent cases, however, soon after the commencement of the secondary fever and while the suppurative process in the pustules of the eruption is progressing actively, the febrile symptoms present more of a typhoid character; the pulse becomes more frequent and feeble, varying from 120 to 140 per minute; respiration unsteady, and sometimes sighing; lips and finger-nails leaden in hue; mind wandering, with subsultus and picking of bed-clothes; and finally involuntary discharges from the bowels, suppression or retention of urine; complete collapse, and death, most frequently between the ninth and fourteenth days from the initial symptoms of the disease. In some of these cases the fatal result is preceded by the appearance of petechial, or hæmorrhagic spots in the skin, or by sudden and copious hæmorrhage from the bowels, or by both. The petechial spots are most apt to occur on the upper part of the chest, sides of the neck, inside of the thighs, and on the legs.

In the truly malignant grade of variola the commencement of the primary fever is marked by a severe chill, followed by intense pyrexia, the temperature rising during the first forty-eight hours to 42° or 43° C. (108° or 110° F.); respirations hurried, irregular, and sighing; pulse very frequent, small, and feeble; face, neck, and upper part of the chest deeply suffused with a purplish redness; extreme sense of oppression across the chest, and distress in the epigastrium, with severe vomiting; more or less delirium; urinary secretion very scanty, and sometimes suppressed; and the bowels quiet, though sometimes loose. The eruption in some of these cases is preceded by the appearance on the evening of the second or morning of the third day of deep red spots upon the surface, sometimes in the form of an exanthematous rash, and in other cases more resembling large spots of roseola. These appearances usually disappear within twenty-four hours, and are replaced by the eruption specially characteristic of variola. The appearance of the latter is not accompanied by any decided diminution of the febrile symptoms, as in the non-malignant cases. On the contrary, all the symptoms I have just mentioned continue, with the addition of petechial spots on the surface, and hæmorrhages from the nose, mouth, stomach, intestines, and in some cases from the kidneys, followed by low muttering delirium, involuntary discharges, and death between the fifth and seventh days. Having indicated the more prominent and essential symptoms accompanying the different grades and stages of variola, I must direct your attention to the successive changes that occur in the pustules, from their appearance on the third or fourth day to their

complete cicatrization between the fifteenth and twenty-first. As I have already stated, the pustule appears first as an elevated, hard, and slightly reddened spot, or papule, easily recognized both by the eye and the touch. In from six to twelve hours later a minute vesicle is readily seen on the summit of the papule, or hard base. From this time (evening of the fourth day) to the seventh day of the disease, or fourth day of the eruption, both the hard base and the vesicle are steadily increasing in circumference, the latter umbilicated, or indented in the centre, and filled with a constantly increasing quantity of transparent serum, or lymph. During this time there is no discoloration of the skin between the pustules, and no general swelling; but at the beginning of the fourth day, after the first appearance of the eruption, an active inflammation attacks each pustule, causing an areola, or circle of redness around the base of each, with considerable tumefaction of the part, and a slightly turbid appearance of the serum in the vesicle. The inflammation and swelling increase for three or four days, during which time the vesicle becomes more distended, and finally, in most cases, loses its umbilicated appearance, while the fluid within has become fully transformed into pus. The stage of inflammation and suppuration having reached its climax on the tenth or eleventh day of the disease, or the seventh of the eruption, in one or two days more a dry, brownish spot appears at the point of previous umbilication in each pustule, which daily increases in size and becomes darker in color until it constitutes a dark-brown or black scab the full size of the pustule and closely imbedded in the surface. As this drying up or desiccating process goes on the febrile symptoms abate, the tumefaction gradually disappears, and cicatrization is rapidly progressing under the scabs. The latter process is usually completed in from five to seven days after the completion of the suppurative stage, when the scabs become rapidly detached, leaving the patient quite free and ready to be washed and clothed in about three weeks from the commencement of the disease. The degree of tumefaction of the surface during the stage of inflammation and suppuration will depend almost entirely on the number of the pustules.

In the distinct, or discrete variety, the swelling of the face is rarely sufficient to close the eyelids, and the secondary fever is mild and of short duration. When the number of the pustules is sufficient to cause them to coalesce, or become confluent, however, the tumefaction is so great that the eyelids are completely closed, the natural lines and expression of the face obliterated, with considerable swelling of the whole surface. In the more severe cases of this variety, as the patient approaches the completion of the suppurative stage, there is much œdematous infiltration into the subcutaneous areolar tissue indicated by pitting wherever pressure is made, and sometimes cellular abscesses form in several places and add to the discomfort of the patient.

I have said nothing thus far concerning the pustules that come in the fauces and pharynx. They appear at the same time and pass through the same stages as those on the surface; but their presence causes, at first, simply a feeling of soreness, with an increased secretion of viscid saliva, or mucus, and when the inflammatory stage comes, the increased heat, soreness and swelling around them, with a more abundant secretion of mucus, is often sufficient to cause much pain and difficulty of swallowing and much annoyance from the necessity of frequent spitting or efforts to clear the throat. In confluent cases, accompanied by numerous pustules in the pharynx, it has sometimes happened that during the suppurative stage the tumefaction around the inflamed pustules has been increased by more or less œdema of the submucous tissue extending to the base of the

epiglottis, and sometimes so obstructing the breathing as to cause death from suffocation. One such case came under my own observation a few years since. In some of these cases the inflammation has extended tot he tongue, causing it to become so swollen as to protrude between the teeth and add much to the difficulty of deglutition. In rare instances one or more pustules appear on the conjunctiva of the eye, causing great irritation and sometimes sufficient ulceration to result in permanent impairment or loss of vision. From the commencement of the suppurative stage to the establishment of convalescence there is a peculiar and unpleasant odor emanating from the body of the sick, which in the more severely confluent and malignant cases is so strong as to impregnate the whole atmosphere of the room and require constant attention to disinfection and ventilation.

Diagnosis.—During the stage of primary fever, before any appearance of an eruption, there are no symptoms so peculiar or distinctive, as to enable the physician to make a positive diagnosis between small-pox and attacks of other active grades of fever.

The abruptness of the attack from a previous state of good health, the rapid rise of temperature, the general redness of the surface, and especially the severe pains in the loins, should be sufficient to excite the suspicions of the practitioner. And if these symptoms have supervened in from nine to fourteen days after a known exposure to the contagion of variola, it would change the suspicion into an approach to certainty.

It is not, however, until the appearance of the eruption that the diagnosis can be made positive. The appearance on the evening of the third or morning of the fourth day, upon the face, neck and upper part of the chest, of a greater or less number of hard elevated points, with minute vesicles forming on the apex of each, and generally accompanied by a marked subsidence of the febrile symptoms, is so distinctive as to leave no room for further uncertainty. The elevation and hardness of the pimples at once distinguishes them from all the exanthematous varieties of fever. The smallness of the vesicle on its first appearance, and its position on a hard and elevated base, equally distinguishes it from the much larger vesicle, without any hard base, that characterizes varicella. Each subsequent day after the first, only serves to make the distinctive features more plain by the enlargement, flattening and umbilication of the vesicles.

Prognosis.—In all cases of distinct or discrete variola, the prognosis is favorable. In all cases presenting only a moderate degree of confluence of the eruption, such as confluent patches of limited extent on the face and back of the hands, the tendency is to recovery. But in the more extensively confluent cases, and those presenting special symptoms of malignancy, there is a strong tendency to fatal results; and no method of treatment has been devised capable of preventing a high ratio of mortality. The general ratio of deaths to the whole number of cases of unmodified small-pox, varies from one in three to one in ten. It is more fatal in early childhood and in old age, than in the middle period of life. A large percentage of the deaths are caused by such complications as pneumonia, œdema of the glottis, endocarditis and uremia from active renal congestion.

Special Treatment.—In speaking of the general principles which should guide us, and the objects to be accomplished in the treatment of the whole class of eruptive fevers yesterday, I stated that it was desirable, in the early stage, to cause the destruction or elimination of as much of the specific cause as possible; to palliate its direct irritative action on the structures of the body; and in the middle and later stages, to sustain the nutrition and strength of the patient. Among the antiseptics

supposed to be capable of neutralizing or destroying animal poisons or specific contagiums, I have found none capable of being used safely in sufficient quantity to make an impression, except the hyposulphites of sodium and calcium. During the last twenty years I have given nearly all the cases of unmodified variola, coming under my care in the early stage, from 0.66 to 1.00 gram. (gr. x to xv) of the hyposulphite of sodium, dissolved in mint water, every four hours; and through the stage of eruption in the confluent cases, it has been continued from three to four times a day. In the discrete variety of cases, its continuance after the establishment of the eruption on the surface, is not necessary. Neither is it necessary to give patients laboring under this mild variety of the disease any active remedies after the primary fever has disappeared. To keep their rooms well ventilated, cleanly, and at a comfortable temperature; to give them light, plain food; an occasional laxative or enema if the bowels do not move without, and a moderate dose of the compound powder of opium and ipecacuanha at night during the suppurative stage, constitutes all the treatment necessary, unless some important local complication occurs. In cases of greater severity, however, accompanied, during the primary fever by great epigastric distress and frequent vomiting, I give six centigrams (gr. j) of calomel with three decigrams (gr. v) of white sugar, every two or three hours, and half way between the powders, four cubic centimeters (fl, ʒi) or a teaspoonful of the carbolic acid mixture (see formula on page 138) until the vomiting ceases and the eruption begins to appear upon the surface. During the same time I apply sinapisms to the epigastrium and along the lower dorsal and lumbar portions of the spine; and while the skin is hot and dry have it frequently sponged over with milk-warm water, and if there is delirium I keep the head covered with cloths wet in water of the same temperature. In these more severe cases, if the hyposulphite of sodium is rejected by the stomach, it can be given by enema. When the eruption has appeared, accompanied by the usual abatement of fever, if the bowels have not moved during the two preceding days, I give a saline laxative sufficient to evacuate the bowels mildly, and discontinue all the preceding remedies, except the solution of the hyposulphite, which I continue at intervals of once in six hours, and secure rest at night by a single dose of 0.4 or 0.5 grams (gr. vi or viii) of the compound powder of opium and ipecacuanha given at bed-time. If pustules appear in the fauces and pharynx, mucilaginous and slightly astringent gargles are used frequently to allay the heat and help to dislodge the excess of mucus. Milk and meat broths are given in quantities sufficient to sustain a good degree of nutrition. When the stage of inflammation and suppuration commences in the eruption, and secondary fever with more weakness supervenes, I discontinue the hyposulphite, and give in its place moderate doses of the tincture of the chloride of iron and sulphate of quinia every four hours; and as this stage progresses toward completion, if the pulse becomes decidedly soft and weak, respiration occasionally sighing, and the mind either dull or wandering, I give four cubic centimeters, or a teaspoonful of the following mixture, between the doses of the quinine and iron:—

℞			
	Ammonii Carbonatis	10 grams	ʒiiss
	Aquæ Camphoræ	110 c. c.	℥iiiss
	Syrupus Simplicis	15 c. c.	℥ss

Mix. Put each dose with an additional tablespoonful of water when it is given to the patient.

Close attention should also be given at the same time to the faithful administration of such nourishment as milk, milk and flour gruel, and meat broths, with small and frequent doses of pretty strong tea or coffee, to maintain nerve sensibility. If, as sometimes happens, the bowels at this stage become loose, giving rise to thin discharges, the emulsion of turpentine and tincture of opium should be promptly given in such doses and at such intervals as is necessary to hold them in check.* If petechial or hæmorrhagic spots appear on the surface, or the intestinal discharges become bloody, suitable doses of strychnine and nitric acid may be given instead of the quinine, between the doses of the emulsion. If free intestinal hæmorrhage occurs, it is proper to use astringent enemas, and for immediate effect in controlling the flow of blood, from sixty to one hundred and twenty milligrams (gr. i to ii) of persulphate of iron in solution with water, may be given every hour until the hæmorrhage is checked, when the emulsion and other remedies should be resumed, as I have just stated.

Malignant Cases.—The genuinely malignant cases of this disease have generally progressed to a fatal result, regardless of the influence of any remedies hitherto proposed. Yet it is the duty of the physician to make an effort to relieve his patient, however small may be the chance of success; and the effort should be founded on some rational indications afforded by the pathological conditions of the patient. If it be true that the special symptoms indicating malignancy depend upon the continued action of the poison on the blood, either through excess of its quantity or its failure to be fully lodged in the cutaneous tissue at the commencement of the eruptive stage, then the first and most important indication is, to neutralize or in some way destroy this excess of virus and thereby render the blood again capable of making its natural impression on the properties of the tissues and the sensibility of the vaso-motor nervous system. I know of no agents better calculated to fulfill this indication, than a combination of the hyposulphite of sodium and carbolic acid, given in such doses and at such intervals as will most rapidly impregnate the blood as fully as is compatible with the safety of the patient. In two cases of a decidedly malignant type occurring in the practice of the late Dr. F. H. Davis, the following formula was given with decided benefit, apparently modifying the condition of the patients to such a degree that both finally recovered. In another case to which I was called during the past year, presenting extensive petechial and hæmorrhagic symptoms, the patient died within forty-eight hours after my first visit, without showing any apparent effect of remedies. The formula I have used is as follows:

℞			
	Sodii Hyposulphitis	25.0 grams	ʒvj
	Acidi Carbolici	0.6 "	grs. x
	Aquæ Menthæ,	130.0 c. c.	ʒjv

Mix. Shake the vial and give four cubic centimeters, or one teaspoonful, in a tablespoonful of additional water every one or two hours until some effect is obtained, and then lengthen the interval between the doses. During the same time the patient may be supported by the taking of carbonate of ammonia and camphor, and the use of nutritive enemas. In all other respects these cases may be treated in the same manner as the more severe variety of the confluent form.

* See formula on page 116.

VARIOLOID.

Soon after the introduction of vaccination as a preventive of variola, it was ascertained that a small proportion of those who had taken the vaccine, at some subsequent period when exposed to the contagion of variola, took the disease, but always had it in a modified form, being shorter in duration and in all respects less severe. To distinguish these cases from those of unmodified variola, they were called varioloid.

You will understand, therefore, that cases of varioloid are simply cases of small-pox, rendered milder and less dangerous to the patient on account of the partial protection afforded by a previous vaccination. All these cases are caused by the true variolous poison or virus; and no matter how mild they may have been rendered by the influence of the previous vaccination, they are all capable of communicating the true unmodified small-pox to any unprotected persons with whom they may come in contact.

Symptoms.—The period of incubation is the same as in ordinary variola; and all the symptoms accompanying the onset of active phenomena and the three or four days of primary fever, are the same as in the corresponding stage of mild or discrete small-pox. The eruption also appears during the night of the third or morning of the fourth day, and presents the same hard, papular elevations, with minute vesicles at the apex, and is accompanied by an entire subsidence of the general febrile symptoms. The amount of the eruption varies very much in different cases, from no more than five or six pustules in some, to a number fully equal to those accompanying the unmodified discrete variety of the variola. The pustules, whether many or few, increase in size, and the vesicles become first flattened, slightly umbilicated, and filled with clear lymph; then are attacked with inflammation and suppuration, but less severely, and accompanied by less tumefaction and less secondary fever than in the mildest cases of the unmodified disease. Consequently the suppurative stage is shorter, many of the vesicles failing to fill up with matter, and the whole drying up and commencing to desquamate in from seven to nine days after their appearance on the surface. From the mildness of many of these cases, and the sparseness of the eruption, some of the patients, not suspecting the nature of their sickness, get up as soon as the primary fever is passed, and go out to their usual places of business, and thereby do more to spread the disease than any other class of subjects.

I have known several cases, in which individuals after suffering severe pains in the loins and back with some general fever for three or four days, were altogether relieved on the appearance of a few pimples on the face and neck, but not liking the appearance of the pimples, have gone directly to some one of the public dispensaries, and in two instances to a physician's office, and sat in the midst of other patients in the waiting-room, until their time came for examination. It is by such means that many individuals not fully protected, come in contact with the contagium of the disease, and take it without the slightest knowledge, on their part, of the time or place of their exposure. It is therefore of great importance that all cases of varioloid, however slight, should be recognized early and subjected to the same complete isolation, as in the more severe cases of small-pox.

Diagnosis.—The sudden development of unusual pains in the back and loins with some general fever, continuing three or four days, and disappearing on the appearance of distinct hard papules with minute vesicles on their apex, on any part of the cutaneous surface, but more especially on some parts of the face, neck, and upper part of the chest, constitute a group of symptoms following each other in such order as to make them

reliably diagnostic of variola or varioloid, even though the pustules did not exceed half a dozen n number.

Prognosis.—The prognosis in varioloid is favorable, cases very rarely terminating fatally, unless from some important complication, as pneumonia, dysentery, etc. Indeed, the essential idea indicated by the word varioloid, is a modified or less severe form of variola. And a case which is so little influenced by the previous vaccination that it proceeds to a fatal result, from its own gravity would certainly be more properly designated as variola than as varioloid.

Treatment.—The treatment of cases of varioloid does not differ in any respect from that required by mild cases of variola. The same care should be exercised to isolate the patient; to preserve strict cleanliness and good ventilation of the sick room; to adhere to a plain, simple diet; and use only such medicines as may be required to regulate the bowels and more important secretions, and to remove any important complications that may arise.

Prophylaxis.—Aside from strict isolation of the sick and the preservation of good sanitary regulations, the principal measure relied upon for preventing the occurrence of both variola and varioloid, or limiting their spread in any community, is vaccination.

VACCINIA.

By vaccination is meant the introduction through the skin, of a virus originally obtained from a peculiar sore or pustule that is occasionally found on the udder of cows; and which not only makes a specific local pustule at the point of introduction, but so changes the condition of the whole system as to render it thereafter incapable of being influenced by the contagium of variola. From what source the cow became affected with the vaccine disease is not known. Some writers have claimed that it was from the disease called *Grease* on the ankles of horses, and that it was communicated to the udder of the cow by the hands of milkmen who were at the same time handling the horses affected with that disease. Others have claimed that the pustules on the cow were simply the result of the contagium of variola, and consequently that the virus of variola and vaccine are identical, the latter having been rendered milder in its properties and effects by its passage through the system of the cow. Though much has been written on this subject, and many experiments performed to prove or disprove this and that theory, the real origin of the vaccine disease in the cow has not been ascertained with any reasonable degree of certainty. The discovery of the true cow-pox and the application of the virus found in the pustules on the udder of the cow to the vaccination of man for destroying his susceptibility to small-pox, was made by Dr. Edward Jenner, a surgeon who commenced practice in Berkeley, Gloucestershire, England, in 1772. His attention was arrested by the remark of a milk-maid, to the effect that she could not take the small-pox because she had previously had a sore on her hand contracted from a sore on the udder of a cow while milking. This led him to a thorough investigation of the subject, by which he identified the true cow-pox pustule and such proofs of its power to protect those individuals from small-pox who had been accidentally inoculated with the virus from it, that he felt justified in trying it, first, on a member of his own family, and subsequently on others. He early communicated freely with the celebrated John Hunter of London who encouraged him to continue his experiments. This he did, and published the full results in

1798. The same year Mr. Cline commenced vaccinating in London with the matter obtained from Dr. Jenner. And though the new practice excited much apprehension and some intemperate opposition both in and out of the profession, yet so rapidly were its benefits demonstrated by actual experience, that in two short years, it received the unequivocal endorsement of the best part of the profession in London and other parts of England.

The next year after Mr. Cline commenced vaccinating in London, the practice was initiated in Boston by Dr. Benjamin Waterhouse, the first professor of practical medicine in the medical school of Harvard University. The new practice met here the same opposition and prejudices as in London, but both were soon overwhelmed by the rapidly accumulated proofs of its safety and efficacy as a preventive of variola. Such was the origin of vaccination, which in less than one century has bestowed upon our race an amount of benefit that cannot be properly expressed in either words or figures. I will not trespass upon your time, however, to enter upon any consideration of the history of vaccination since the days of Dr. Jenner, but assuming that it affords a safe and reliable mode of preventing one of the most destructive and loathsome diseases in the list of acute affections, I will call your attention at once to the following questions of great practical importance: First, what are the characteristics of the genuine vaccine disease as developed in the human subject by vaccination? Second, what is the best method of procuring and preserving reliable vaccine virus for use in ordinary practice? Third, in what manner and at what times should vaccination be practiced in order to insure the most reliable protection from variola?

In answer to the first question, I will say that when the vaccine matter is introduced into, or placed in contact with the cutis vera, at some point on the cutaneous surface, there is no appearance of active influence until some time between the beginning of the fourth and sixth days; when there appears at the point of insertion a slightly red and hard elevation, which in twenty-four hours more has increased in circumference and developed a slightly flattened vesicle on its surface. Both the hard base and the vesicle continue to increase in size (the latter becoming indented or umbilicated in the centre), for about four days after their first appearance, during which time the vesicle is filled with transparent lymph contained in several distinct compartments, as in the vesicles of variola. At the end of the fourth day of progress, or the eighth after vaccination, a red areola appears around the base of the sore, accompanied by some swelling, heat and slight pains, with a slightly turbid appearance of the lymph.

The redness and tumefaction increase for three days more, accompanied by slight general fever; sometimes pains in the head, back and limbs; occasionally swelling of the glands in the axilla; and always a more complete conversion of the contents of the vesicle into a thick straw-colored pus. At the end of this time, about the eleventh day after the vaccination, the pustule or pock has reached its full maturity; a dark-brown spot now appears in the center of the sore at the point of umbilication; the redness and swelling begin to abate; the general feverishness disappears; and by the fifteenth day, a dark-brown thick scab has taken the place of the vesicle. Cicatrization goes on under this scab, and somewhere between the twenty-first and the twenty-fifth days it is completed and the dry scab falls off, leaving a concave cicatrix with from one to four or five distinct depressions, or pits as they are generally called. The presence of these pits or indentations in the cicatrix is permanent, and ever

afterwards affords proof that the vaccine sore was genuine. The formation of these indentations in the scar resulting from a true vaccine sore, may be prevented, however, by unusually deep or extensive ulceration during the suppurative stage of the sore. Consequently their absence from the scar cannot be regarded as conclusive evidence that the vaccination was spurious. You will see by the description I have given, that a true vaccine sore or pustule develops in the same manner and passes through the same stages as the pustule of variola, differing chiefly in the attainment of a much larger size than any single pustule of the latter.

On the contrary, the sores produced by the use of spurious vaccine matter, commence sooner after its introduction, run their course more rapidly to the suppurative stage, seldom present any distinct umbilication, and either dry up early and leave a smooth cicatrix, or extend the suppurative stage into a large spreading ulcer with an abundant formation of thin pus, and no disposition to cicatrize. Sometimes, though rarely, the progress of true vaccination is accompanied by a scattering eruption of small vaccine pustules on different parts of the surface. These pass through the same stages and disappear with the parent sore.

Methods of procuring and preserving the vaccine matter for use are numerous, and each has its advocates. Until a recent date the disease was propagated exclusively by taking the matter from the vaccine pustule on the arm of one individual to vaccinate others, thereby extending it from individual to individual by what is now called humanized virus.

Many preferred to use the transparent lymph obtained from the vaccine vesicle just before the commencement of the suppurative stage. By pricking the vesicle at this stage the drops of lymph that ooze out may be received on quill or ivory points, allowed to dry on, the same enveloped in a little cotton, and kept in a dry, well-stopped vial until needed for use. The leading objection to this method is, that the virus is so much exposed to the air that it will retain its activity but a brief period of time. Another method consists in receiving the lymph, at the same stage of the vaccine vesicle, into capillary glass tubes, hermetically sealing them, until needed for use. By this method the virus may be preserved active for a long period of time, provided the tubes remain unbroken, and are not exposed to too great extremes of temperature. In this country perhaps the larger number of practitioners have preferred to let a genuine vaccine pustule complete its course unbroken, until cicatrization is complete and the dry scab is loosened and ready to fall off. The dry scab is then taken, allowed a few hours for further drying, and preserved for use in one of the following modes: First, the dry scab may be immediately wrapped in tin foil and inclosed in the center of a ball of white wax. This excludes nearly all the air and is capable of preserving the active properties of the scab several weeks. Second, the dry scab is comminuted or broken up and mixed with pure glycerine, which is capable of dissolving the active principle of the scab, and if the vial is kept well stopped, and secluded from the light, preserving it active for an indefinite length of time. One fresh ordinary sized scab is capable of impregnating from one to two drams of glycerine. Third, a fully matured and dry scab may be cut into four pieces, each piece closely enveloped in foil, and one of them placed in the center of a ball of white wax for immediate use, while each of the other three should be placed in glass tubes hermetically sealed at one end, the air mostly expelled by a moderate heat and the other end sealed quickly, and kept secluded from light or high heat until needed for use. When needed, the tube is broken and the inclosed piece of scab transferred to the ball of wax as already mentioned. This can be open-

ed, a part of the scab shaved off on a clean piece of glass, and the rest returned to the wax enclosure, as often as a person is presented for vaccination, until it is all used, or by time and repeated exposure to the air, its active properties have been lost. If the general practitioner will see that every baby born within the circle of his practice, is properly vaccinated between the ages of four and eighteen months, he can easily select scabs enough from the arms of strictly healthy children, to keep his supply good, if prepared in the manner last indicated. It is the method that I have practiced for more than thirty years with almost uniform success, and without any bad results. The scab should be allowed to fully mature on the arm, and should be selected only from strictly healthy children undergoing a primary vaccination. Until 1866, the humanized virus, obtained and preserved in some one of the ways just mentioned, was solely relied on by the profession for vaccination. At that date a case of spontaneous vaccinia or cow-pox, was discovered at Beaugency, in France, and the virus obtained from that case was carefully multiplied and propagated by successive vaccinations from one heifer to another, under the direction of M. Depaul, of the French Academy of Medicine. The work was sanctioned by the Academy and aided by the French government.

The fresh virus thus obtained was used for human vaccinations, under the name of bovine or non-humanized virus.

In 1870, virus from this stock was obtained by Dr. Henry A. Martin, of Boston, who immediately commenced, and still continues, its careful propagation from heifer to heifer, and from whose establishment near Boston, large quantities of the virus have been furnished to the profession in all parts of the country, and extensively used as a substitute for the humanized virus previously so universally depended upon.

The demand for the bovine virus increased so rapidly that several other establishments for its propagation have been started in different parts of the country, the virus from which appears at present, to be wholly superseding that obtained from the human subject. The impression has become quite general, that the protective influence of the bovine is superior to that of the humanized virus. I am constrained to say, however, that I deem the evidence on this point by no means conclusive. That the fresh bovine virus furnished from the propagating establishments generally produces a larger vaccine sore, more intense local inflammation, and more specimens of large, open ulcers, slow to heal, I think is fully proved by the experience of the profession in this city. I have certainly seen a larger number of such results in the last two years, during which the bovine virus has been so extensively used in this city, than during all the years of my professional life previously. This, however, is no proof that the protective influence is greater, or more permanent.

Indeed, if you remember that it is only eleven years since Dr. Martin introduced and commenced the propagation of the Beaugency stock of virus in this country, you will readily perceive that the time since the first vaccinations with it, has not been sufficient to afford an opportunity to make any deductions concerning the comparative durability of its effects. I can find nothing in the known laws governing the development of organic matter, which would explain why a particular specific virus should deteriorate any more by transmission from one child to another, than from one heifer to another. And as a matter of clinical experience, I must say that I have discovered no difference whatever between the degree of protection afforded by a genuine vaccination with humanized virus now, and fifty years ago. During that whole period I have not known a single instance where a successful vaccination with matter taken from a genuine

vaccine pustule resulting from a primary vaccination, has not afforded full protection for at least a term of ten or fifteen years. I say matter from a pustule resulting from a *primary vaccination*, because I am well satisfied that all the deterioration which has taken place in the humanized virus since the days of Jenner, has resulted from the use of lymph or scabs taken from secondary vaccinations, or imperfect vaccine sores, and which may be regarded as bearing the same relation to the primary vaccination that varioloid does to variola.

From a full consideration of this important subject, I am satisfied that the safest and best course for every practitioner to pursue is, to procure a supply of fresh bovine virus, select a healthy child between two and five years of age, never before vaccinated, introduce the fresh virus at the proper place on the arm, and if a good characteristic vaccine sore is produced, let it run its complete course undisturbed, and when the dry scab begins to loosen, take it off, leave it exposed to the air a few hours until more perfectly dry; then take one-quarter of it for immediate use, enclosed in foil and wax, as already described, and put each of the other quarters into as many glass tubes, hermetically sealed for longer preservation as reserve stock.

Let him make it a rule of professional life to see that every child born within the circle of his practice, is vaccinated with the matter he has in store, and as often as he finds a healthy child from healthy parents, save the vaccine scab and treat it as just described, and he will not only be able to keep his stock good for five or ten years at a time, but he will have the satisfaction of affording the highest degree of protection to those who depend upon him as a medical adviser, with the smallest number of casualties or bad results. If by some chance his stock fails, immediately procure a fresh supply and commence the work of independent propagation anew. While I have no hesitation in recommending this as the safest and most reliable course for every general practitioner to pursue, the demands of public institutions and municipal health boards, will make the continuance of a few well-conducted establishments for propagating the bovine virus not only a convenience, but a public necessity, even if they should require governmental aid and regulation. And this brings me to the third and last question, namely, in what manner and at what times should vaccination be practiced? I know of no simpler or better mode of practicing vaccination than to very lightly scarify one or more places on the arm near the insertion of the deltoid muscle, on which the vaccine matter should be placed in a liquid or moist condition. The best instrument for the purpose is a sharp pointed knife or lancet, and the scarifications should be so directed as to scrape off the cuticle, carrying the incisions just deep enough to make the blood visible without causing it to start out in drops.

If you have the virus on quill or ivory points, these should be moistened with clean water when you commence to scarify, and then rubbed freely into the scarified place. If you use the dry scab, a small part of this should be shaved off on a clean piece of glass or earthen, and rubbed up with just water enough to moisten and dissolve it, then taken up on the point of the knife and placed on the scarified spot, and rubbed or pricked into it with due care. After the matter is introduced, it should be left uncovered until entirely dry, and then covered only by the ordinary clothing.

Some statistics have been published which seem to indicate that the degree and durability of the protection from vaccination depends in some measure on the number of vaccine sores made on the arm. Consequently

it has become a common practice to scarify two, three and sometimes four places on the arm, thereby producing a corresponding number of sores.

So far as these statistics have come under my observation, they are too meagre in amount, and unaccompanied by certain collateral observations which are essential to give them value. For instance, each case should be accompanied by the age at which the vaccination took place, and the number of years intervening between the latter and the time of taking the variola. In vaccinating infants under one year, I would make but one sore. In older children and adults, it may be well to make two points of insertion. In regard to the times at which vaccination should be practiced, all agree that every child living, and in ordinary health, should be vaccinated, if possible, between the ages of six and eighteen months. The operation should be considered of sufficient importance to receive the careful attention of the physician, and it would be better if its efficiency should be tested by a second vaccination, one or two months after the first.

Having thus secured a genuine and efficient vaccination in infancy, there is no need of repeating it until the child has arrived at maturity of growth, between eighteen and twenty-five years of age. Then the vaccination should be repeated, and tested with the same care as at the first. I think thorough vaccinations with virus of known active qualities, at the two periods named, is sufficient for the whole life-time, except in those individuals, who, after the second vaccination, have suffered some attack of disease, whereby their tissues become so wasted, that the repair is almost equal to a new growth, or have made a radical and permanent change of climate.

Such exceptional cases should be vaccinated a third time, after the changes mentioned have taken place. While these are all the vaccinations I deem necessary for the safety of the individuals and of the communities, provided they are done with proper care, and with virus known to be genuine and active, yet every physician is justified in vaccinating his patrons as much oftener as they desire, provided their fears can not be allayed without so doing.

LECTURE XXV.

Varicella—Its Symptoms, Diagnosis and Treatment. Sudamina—Scarlatina—Its History, Symptoms and diagnosis.

GENTLEMEN: I shall first occupy your attention with the consideration of varicella or chicken-pox. The name, varicella, literally means *little small-pox*, and was adopted in the early period of medical history, when the disease was very generally regarded as a modified form of the variola. That it is entirely distinct and unconnected with small-pox, however, is proved by the following facts: The period of incubation is longer; the primary fever before the eruption is shorter; the eruption is purely vesicular, instead of pustular, and completes its course in much less time, and one attack of varicella affords no protection against subsequent attacks of variola, neither does one attack of variola or of vaccinia, afford any protection against varicella.

It prevails chiefly in epidemic form, and almost exclusively among children and youth, though it sometimes occurs during adult life.

It is contagious or communicable from one child to another, and rarely attacks the same patient more than once. Most of the attempts to propagate the disease by inoculation have failed. Its period of incubation is stated variously by different writers. By some it is placed from twelve to seventeen days (Flint); by others as short as from four to five days (Hartshorne). The primary or premonitory fever is only one day, and is so slight as not to attract any attention in many cases until the eruption begins to appear. In other cases it is sufficient to cause two or three degrees elevation of temperature; slight increase in the frequency of the pulse, with aching pains in the head, back and limbs, and some restlessness. The eruption begins on the second day, and is often the first thing to attract the attention of the patient or of those about him. It generally appears first on the body, and quickly extends to the neck and scalp, the vesicles being scattered or widely separated from each other, and new ones continue to appear for two or three days, during which time the general febrile symptoms disappear. The vesicles constituting the eruption vary in size from that of a pin's head to the circumference of a large pea. They are preceded for a few hours by a simple red or rose-colored spot on the surface, without hardness or elevation, and soon give place to the vesicle, which attains its full size in a single day, is filled with transparent lymph, and by the third day has commenced to shrivel or dry up, without any decided areola of redness around it, and without suppuration or tumefaction of the surface. The scab formed is thin, light-colored, and falls off, leaving no permanent cicatrix or indentation. The whole course of the disease is usually completed in from seven to nine days. The disease is so brief and mild in its character as to require little or no professional attention.

Diagnosis.—The chief interest attached to it relates to a proper diagnosis between it and the other eruptive fevers. The only one of these with which it could be confounded without great carelessness, is varioloid. But if you remember that the primary fever in both variola and varioloid is three days, and is of considerable severity, and that the eruption is in both always papular and elevated, with only a minute vesicle on the point of the papule, while in varicella the primary fever is so slight as to attract but little attention; and that the eruption appears on the first or second day, and is a simple, plain vesicle filled with transparent lymph, without any hard base, without umbilication or indentation in the center; and that it begins to shrivel or dry up without inflammation in three days; you can hardly fail to distinguish the varicella from the varioloid and variola. Still greater is the contrast between the fair-sized, prominent vesicle of varicella, and the small red points constituting the eruptions of scarlatina and measles.

Treatment.—A very large majority of the cases of varicella need only hygienic management; rest, a mild, simple diet, and the maintenance of a comfortable temperature, with proper ventilation, and cleanliness, are all that is necessary. In a very few of the more severe cases, it may be better to act gently on the secretions and promote regular intestinal evacuations, by giving the patients moderate doses of the bi-tartrate of potassium dissolved in cold water, with a little sugar. If four grams (℥i) of the bi-tartrate are dissolved in an ordinary sized tumbler, full of cold water, and a little sugar added to render it palatable, from four to sixteen cubic centimeters may be taken every three hours during the day, the dose being varied in accordance with the age of the patient. If at any

time the bowels become too loose, a moderate dose of the compound powder of opium and ipecacuanha, may be given at night, and it will both correct the looseness and promote sleep. No important sequelæ follow attacks of varicella.

SUDAMINA.

There is no distinct form of febrile disease called sudamina; but the name is applied to an eruption of very small, white, or silver-colored vesicles that sometimes appear on the skin during the progress of many febrile diseases; more especially those cases which are characterized by copious and protracted sweating. Their appearance is generally limited to the trunk of the body and lower part of the neck. The vesicles are usually not more than one line in diameter, filled with perfectly transparent fluid, and pretty closely aggregated, but they are so small and colorless that their presence is easily overlooked. The contents of the vesicles give an acid reaction, and contain chlorides. They give no uneasiness to the patient, and usually shrivel up and disappear in from three to five days, with roughness from desquamation of the cuticle. They are most frequently seen in those cases of acute rheumatic fever, accompanied by continuous sweating, and in such cases of typhoid and typhus as present the same symptom for one or more days at a time. Indeed, the eruption appears to be caused by excessive perspiration, especially of an acrid or sour reaction, and the fluid in the vesicles appears like retained perspiration. No treatment is needed for this form of eruption.

SCARLATINA.

I come now to consider the exanthematous group of eruptive fevers. The most important of these is scarlatina, or scarlet fever, as it is familiarly termed.

History.—A careful reading of the histories of epidemics, in which cutaneous eruptions and inflammations of the throat and glands of the neck were prominent symptoms, of which there were many in different parts of Europe during the first five or six centuries of the Christian Era, leaves no doubt but that scarlet fever constituted a part of several of these epidemics. It was not differentiated from measles, roseola, and some forms of angina until the middle of the sixteenth century. In 1556 Ph. Ingrassias published an account of an epidemic in Italy, under the name of *roseola*, which was plainly identical with the scarlatina of our time. The disease prevailed with considerable severity in London, from 1661 to 1675, and was very accurately described by Sydenham, under the name of "Febris Scarlatina," in a paper published in 1676. Since that time it has prevailed to some extent in all the countries of Europe, and has extended to some parts of Asia, Africa and America. Its periods of epidemic prevalence usually continue from one to three years, especially in large cities, with intervals of from three to five years of comparative exemption. Throughout the temperate zone its greatest prevalence is generally in the transition seasons, spring and autumn, though no part of the year is exempt from a liability to its prevalence. It often prevails coincidently with diphtheria in the same communities; and sometimes, though rarely, some of the more prominent symptoms of both diseases are found existing in the same patient. For instance, the inflamed surface of the fauces and tonsils may present a well marked diphtheritic coating, while the cutaneous surface is covered with an exanthematous eruption identical with scarlet fever. A large majority of the cases of scarlatina occur between

the ages of two and six years. After six or seven years of age the susceptibility to the disease diminishes as the age increases. Yet rare cases have occurred in a few weeks after birth and in old age. One attack of the disease so far removes the susceptibility to future attacks, that very few children have the disease a second time.

Symptoms.—After a period of incubation, averaging from five to seven days, the active symptoms of scarlet fever usually commence abruptly, without having been preceded by any prodromic or forming stage. The child is first seen to turn pale, and seek its mother's lap or lie down on the floor, or on whatever is most convenient, and soon vomits sufficiently to reject whatever was contained in the stomach at the time. Sometimes the vomiting is accompanied by slight rigors, which last for a few minutes only and give place to a rapid access of general fever. The face becomes flushed, the skin hot and dry, the pulse and respiration accelerated in frequency, the urine scanty and high colored, the bowels natural, with a blush of deep redness in the membrane covering the fauces and tonsils, and a sense of stiffness or soreness behind the angles of the jaw, causing some pain in deglutition, and frequent turns of restlessness. These symptoms usually continue about thirty-six hours before the eruption or rash appears on the skin, constituting the stage of primary or premonitory fever. In mild cases the symptoms just enumerated are moderate, and the temperature does not rise above 39° C. (103° F.), and are not accompanied by any notable swelling of the glands of the neck.

During the latter part of the second day, a fine red efflorescence or rash begins to show itself; first on the face, neck and upper part of the chest, which extends downward over the trunk of the body and extremities in about twenty-four hours, so that by the end of the third day the whole surface is covered with a fine red rash, pretty evenly diffused, and consisting of small red points, neither hard nor elevated so as to be perceptible to the touch, and without the slightest appearance of vesicles. The rash rather increases in redness for three days, or until the fifth day from the commencement of sickness, when the whole cutaneous surface presents a bright red and finely dotted appearance, and the general febrile symptoms have reached their maximum of intensity. From this time the rash begins to fade and the general febrile symptoms to abate, and in from two to three days more both have disappeared, leaving the patient convalescent in from seven to nine days from the commencement of the disease. During the decline of the rash, there is much prickling and itching in the surface, which becomes rough from the gradual exfoliation of the cuticle. When the disease runs the simple course I have now indicated, it is called by most writers *scarlatina simplex.* In a more severe form of the disease, the mode of access is the same, but all the symptoms accompanying the primary fever are more intense, the temperature often rising to 40° or 41° C. (104° to 106° F.), the pulse ranging from 110 to 130 per minute, with a proportionate increase in the frequency of respiration, and, in addition, the fauces and tonsils become more red and swollen, with rapid swelling and tenderness of the glands behind and below the angle of the jaw, causing difficulty and pain in swallowing, and adding much to the restlessness of the patient.

The characteristic eruption or rash appears first on the face and neck, about the end of the second day, and increases, as already described, pari passu, with a continued increase in the inflammation and tumefaction in the fauces and glands of the neck, and the maintenance of the general febrile phenomena until the beginning of the fifth day. From this time the rash begins to fade and disappears, leaving the skin rough from exfoliation of

the cuticle between the seventh and ninth days, as in the scarlatina simplex. But on the fifth day, when the rash begins to fade, the inflammation in the fauces and glands of the neck has only reached its climax. The secretion from the inflamed mucous membrane, which up to this time had been transparent and tenacious, adding much to the embarrassment of breathing, and causing occasional paroxysms of coughing, now becomes more opaque and abundant, and the membrane itself, especially over the tonsils and folds of the palate becomes ulcerated, and the glands and tissues behind the angles of the jaw remain swollen and hard, making it difficult to open the mouth wide enough to permit an examination of the throat, and equally difficult to administer medicine or nourishment. The local inflammations cause the pulse to remain frequent, but soft, and the temperature above the natural standard, and add much to the exhaustion of the patient. But in a considerable proportion of these cases, after the end of the first week, the swelling of the glands slowly diminishes, the ulcerations in the fauces and throat cease to spread and gradually take on a reparative action, and by the end of the second week, convalescence is fairly established. In cases a little more severe, the inflammation, about the fifth or sixth day, extends from the fauces into the posterior nares, and soon involves the whole Schneiderian membrane, obstructing the nostrils and causing a muco-purulent discharge, sometimes offensive, and adding much to the discomfort of the patient. During the same time, in a smaller number of cases, the inflammation extends through the eustachian tube to the middle ear, causing pain, suppuration, perforation of the tympanum and purulent discharge from the external meatus.

In a large proportion of these cases, if recovery from the acute general disease takes place, there remains a chronic otitis with permanent impairment of hearing. In many of the cases presenting severe inflammation in the throat, glands of the neck, nostrils and ears, the respiration and deglutition become so much obstructed that, somewhere between the fifth and ninth days, the pulse becomes very small, frequent and feeble ; respiration irregular and frequent ; the temperature high ; urine very scanty and often albuminous ; the mind dull and inclined to sleep, but often roused to paroxysms of great restlessness by the obstruction in the throat; soon the hands and feet begin to feel cold and look leaden color or purple; and the patient dies apparently from exhaustion. In some of this class of cases, gangrene attacks the tonsils and other more intensely inflamed parts of the fauces, causing the breath to be very offensive, and adding to the rapidity of the exhaustion. All the cases accompanied by the different degrees of inflammation and tumefaction of the glands of the neck, as I have just described, are included by writers under the head of *scarlatina anginosa.* In nearly all of the more severe epidemics of scarlatina, cases are met with in which, from the very beginning of active symptoms, the pulse becomes extremely frequent and feeble; the temperature from 41° to 43° C. (106° to 110° F.) ; respiration, irregular and panting, like one tired; the surface more or less congested and sometimes mottled with purplish spots ; the extremities cool and blue or leaden color; the mind dull and sometimes incoherent, with paroxysms of great restlessness; and, in some, there is swelling of the glands of the neck, and in others none. In most of these cases the characteristic exanthem or rash makes its appearance on the evening of the second day, and is often accompanied by petechial spots, increasing exhaustion and death between the third and fifth days. I have seen a few cases in which death took place in from twenty-four to thirty-six hours after the initial symptoms. The cases presenting the symptoms just detailed present all the character-

istics of malignancy, and constitute a group described by authors under the name of *scarlatina maligna*.

You will notice, from the detail of symptoms I have given, that scarlatina varies very much in the degree of its severity in different cases—from a very mild, simple, irritative fever, of short duration, and uniformly tending to recovery, to one of the most malignant and rapidly fatal that the physician has to encounter. And cases are met with presenting every gradation between these extremes, leaving no well-defined line of separation between those designated as *scarlatina simplex*, *scarlatina anginosa*, and *scarlatina maligna*. Consequently you must understand these terms as indicating simply different degrees of severity, both in general phenonema and in local complications. There are not only great differences in the severity of different cases in the same season, but equal diversities in the character of different epidemics. I have known several epidemics, in which large numbers were attacked, and nearly all the cases were of the simple, or moderately anginose variety. I have witnessed other epidemics in which a large proportion of all the attacks were severely anginose or malignant.

Diagnosis.—Scarlatina, in all grades of its severity, is distinguished from variola and varioloid by the shorter duration of the primary fever before the eruption, the greater frequency of pulse and respiration, the bright redness in the fauces with tumefaction of the tonsils, and, in many cases, swelling of the lymphatic glands in the parotid and sub-maxillary regions, and still more by the character of the eruption when it appears; the latter consisting of very small red points with general redness of the surface, but neither elevated nor hard to the touch, while that of variola and varioloid is both, with a small vesicle on the top; and that of varicella is equally prominent and more largely vesicular from the beginning. From rubeola, or measles, it is distinguished by the absence of the coryza, cough and other catarrhal symptoms that accompany the latter; by the greater intensity of the fever; the earlier appearance of the eruption; and the smaller and more evenly diffused red points that constitute the rash or exanthem. The same characteristics also distinguish it from rötheln and roseola.

Prognosis.—The prognosis in cases of scarlatina simplex is always favorable, so far as the direct results of the fever are concerned. But experience has shown that even the mildest cases are liable to be followed, during convalescence, by that form of acute renal congestion which speedily develops general dropsical swelling, insufficient excretion of urea and other elements of urine, and consequent dangerous poisoning of the nervous centers. The anginose variety of scarlatina is dangerous in proportion to the extent and intensity of the inflammation in the fauces and adjacent lymphatic glands. During the active progress of cases belonging to this grade of the disease, the urine sometimes becomes scanty and contains both albumen and tubular casts, indicating a dangerous degree of renal congestion. In a small proportion of cases, convulsions occur, either at the beginning or during the progress of the primary fever, and add much to the gravity of the disease. Cases complicated by the appearance of diphtheritic exudations on the membrane lining the fauces, posterior nares, or larynx, are very liable to terminate fatally. The prognosis, in cases of a true malignant character, is extremely unfavorable, recoveries being exceptions to the general rule. Adults, when attacked by scarlatina in any of its grades, are even more liable to a fatal result than children. When it attacks a pregnant woman it creates a strong tendency to a miscarriage or a premature labor, and is very apt to terminate fatally, although some cases of this kind have recovered.

Pathological Changes.—The morbid changes which take place during the progress of scarlet fever, are chiefly such as result from the inflammations in the skin, mucous membrane of the fauces, glands of the neck and kidneys. Each exanthem or red point on the cutaneous surface is caused by an inflammatory congestion of the vessels of the corium, or layer immediately beneath the epidermis, with a slight accumulation of lymphoid cells. In all ordinary cases there is not sufficient exudation to cause any elevation or hardness, and even the redness mostly disappears after death. In some instances in which the rash was strongly developed, slight extravasations of serum and blood corpuscles have been discovered in the rete malpighii and in the lumen of the sweat-glands. The congestion of the vessels is sufficient to interrupt the natural relations between the cutis vera and the epidermis, so far as to cause a very general exfoliation of the latter on the subsidence of the cutaneous inflammation. The exfoliation over the surface generally is in the form of thin lamina, but in the palms of the hands and soles of the feet it sometimes separates in large thick layers. In all the anginose cases the mucous membrane covering the fauces, tonsils and pharynx is found intensely red from congestion of blood in the vessels, more or less swollen, and often ulcerated or, in patches, destroyed by gangrene. In many cases the mucous membrane lining the posterior and middle part of the nostrils is in the same condition. In the same class of cases the tonsils and many of the adjacent lymphatic glands are much tumefied from congestion of vessels, exudation of white corpuscles and plastic material and sometimes the formation of abscesses from a true phlegmonous inflammation. The inflammation and suppuration often extend into the connective tissue behind and beneath the angle of the jaw; and, in some cases, burrow in behind the pharynx, and not only render breathing and deglutition difficult, but sometimes break and discharge the matter into the pharynx so fast as to be drawn into the larynx and cause suffocation.

A case terminated fatally from this cause, under my own care, nearly forty years since. The patient was a female child about two years of age, who had passed through the active stage of severe scarlatina anginosa, during which the glands and connective tissue near the angle of the jaw became very much swollen and hard. Suppuration took place deep beneath the faciæ of the neck, and extended inward and downward behind the lower part of the pharynx, and before distinctly pointing externally, broke almost opposite the epiglottis, and filled the throat so rapidly as to cause immediate suffocation. Post-mortem examinations also show, in some cases, severe inflammation and suppuration in the middle ear, with perforation of the tympanum, and sometimes necrosis of the small bones. In some epidemics of scarlatina, the mucous membrane covering the tonsils and other parts of the fauces, has been found covered with a layer of fibrinous exudation, closely resembling, if not identical with, the membranous exudation in diphtheria.

Heubner has attempted to show that the membrane thus seen in some cases of scarlatina is not identical with that of true diphtheria, but is thinner, and disintegrates without ever being detached or expectorated in shreds or patches. He also claims that scarlatinal fibrinous material is exuded beneath the epithelial cells and into the connective tissue of the submucosa. All parties admit, however, that the micrococci found present in the exudation are the same in both diseases. Having, in my own experience, never seen fibrinous exudations on the tonsils and fauces of scarlatina patients, except when diphtheria was more or less prevalent in the community at the same time, I have regarded its presence as evidence

that the causes of both diseases were influencing the patient coincidently, similar to the coincident action of the causes of typhoid and periodical fevers, in producing what has been called typho-malarial fevers.

The frequent occurrence of albumen in the urine, during the progress of scarlet fever, and of the marked evidences of inflammatory congestion of the secreting structure of the kidneys after death, renders it probable that the scarlatina poison, or contagium has much the same affinity for the renal tubules, that it has for the skin. In many post-mortem examinations the kidneys were found enlarged and pale externally, with marked congestion of the vessels connected with the tubules and glomeruli, and detached epithelial cells filling and obstructing the former. It is this action of the scarlatina poison on the renal organs, that determines the frequent occurrence of acute and chronic renal affections, accompanied by dropsical symptoms as sequelæ of the general disease.

Complications and Sequelæ.—The most important complications occasionally met with during the progress of scarlatina, are lobular pneumonia, nephritis, pericarditis, convulsions, and sub-acute articular rheumatism; while chronic otitis, with purulent discharges, acute and chronic renal congestions and degenerations, with dropsical accumulations, rheumatism, chorea, and general anemia, constitute the most frequent and important sequelæ. The complications mentioned may occur at any time during the active progress of the general disease; but they are most apt to be developed between the fifth and ninth days after the commencement of the fever, that is, during the decline of the eruptive stage. The various sequelæ may begin at any time during the convalescence, or within from one to six weeks after the beginning of the desquamation of the cuticle.

Treatment.—The objects to be accomplished in the treatment of scarlet fever, may be stated as follows:

First, to remove the further action of any predisposing causes that may exist, and to neutralize or destroy the specific contagium in the system. Second, to lessen the direct irritative and disturbing action of the specific cause on the properties of and molecular changes in the blood and organized structures of the body, by such remedies as allay morbid excitability, lessen temperature, and promote natural secretory action. Third, to lessen the severity of the local inflammations, especially in the throat, glands of the neck and kidneys. Fourth, to sustain the nutrition and strength of the patient, and promote the repair of such structures as may have suffered injury during the active progress of the disease.

As the predisposing causes of scarlatina are chiefly impure air from imperfect ventilation, uncleanliness and bad sewerage, so, when cases of the disease actually exist, the attending physician can not be too careful to have his patient freed from the furthur influence of all such unsanitary conditions. It is very important that the room of the scarlet-fever patient should be well ventilated, cleanly, and kept at a temperature no higher than is pleasant for a person in good health. Neither should the child be wrapped in any unusual amount of clothing. You will find many families manifesting a persistent determination to violate these rules. As soon as they are aware that a child has this variety of fever, they will have it closely bundled from head to foot with all the shawls and blankets they can get around it, have all the doors and windows closely shut, and heat the room to an uncomfortable degree.

They could hardly do anything that would have a more debilitating influence, or render the patient more susceptible to cold, or more disposed to suffer from renal congestion and dropsical effusions during the convalescence. In regard to remedies for destroying or neutralizing the speci-

fic contagium in the system, and thereby arresting its further disturbing influence, we have none that have proved efficient or entirely successful when subjected to the test of direct clinical experience. Many have been tried, and received more or less commendation; the more important of which are iodine, chlorine in solution with chlorate of potassium, permanganate of potassium, the hyposulphite of sodium or calcium, sulpho-carbolate of sodium, benzoic acid, and the benzoate of sodium. I have used all these remedies, more or less, in the treatment of the early stage of scarlatina. In some instances they appeared to lessen the severity of the symptoms and favorably modify the progress of the disease, but in no instance have I seen the disease arrested or rendered abortive, as though its essential cause had been destroyed. For fulfilling the second indication specified, the most safe and efficient remedy is the frequent sponging of the whole surface with cold water, and, in bad cases, the application of the wet sheet with the sprinkling, in the same manner as I have detailed when speaking of the treatment of typhoid fever. Judiciously used, it will do more to allay the extreme excitability, lessen the temperature, and favor natural molecular changes during the first four or five days, than can be done by all other remedies. It was chiefly in the treatment of scarlet fever that Dr. Currie, of London, demonstrated the value of free applications of cold water to the surface as an antipyretic, more than a century since. The common fear that frequent sponging of the cutaneous surface with water will prevent or repel the eruption is entirely without foundation. I think it was Dr. Anderson, of Alabama, who, in describing one of the most malignant epidemics of scarlet fever that ever occurred in that State, spoke of the thorough application of cold water to the surface as one of the most efficient means adopted for the relief of the more severe cases.

The epidemic to which I allude prevailed prior to 1850, and the paper of Dr. Anderson was published in one of the volumes of Fenner's Southern Medical Reports, which I have not now at hand for accurate reference. In a report made to the Scott County Medical Society, in 1850, Dr. W. L. Sutton, of Georgetown, Ky., says, in commenting on the treatment of scarlatina, as it prevailed in that State, "the external application of water, cold or warm, is inferior to no other remedy."* Dr. R. K. Smith, of Delaware county, Penn., in speaking of the treatment of an epidemic of this fever, prevalent in that county in 1851, says the treatment most successful in his hands was "cold ablutions, followed by cold inunction with lard and neutral mixture, and aperient medicines internally." Dr. Hiram Corson, of Montgomery County, Pa., alluding to the prevalence of the fever in that county, the same year, expresses "great confidence in the efficacy of cold affusions." Similar testimony is borne by Drs. J. P. Heister, of Reading, and N. Hayes Clark, of Newark, the same year.† I give you these references for two purposes, namely: to show that the free application of water to the surface in the treatment of scarlet fever has been practised by many American physicians for half a century; and that the effect in reducing temperature, lessening excitability and restlessness, and promoting normal actions in the system, is as prompt and beneficial as when applied to cases of typhoid, typhus, or any of the other acute general diseases.

For further correcting the general derangements of secretory and molecular action in the severe anginose cases, three or four alterative doses of calomel, given during the first twenty-four hours, and the subsequent use of the aqueous solution of iodine, in doses suited to the age of the patient, constitute as efficient measures as we can adopt. I deem it important to

* See Transactions of the Amer. Med. Association, Vol. IV, p. 120. 1851.
† See Transactions of the Amer. Med. Association, Vol. V, pp. 321, 2, 5, and 41, 1852.

avoid all active evacuants, as emetics and cathartics during the first two days, as liable to divert the specific cause or contagium from its natural tendency to lodgment in the cutaneous surface and favor its retention in the blood. Such movements of the bowels as may be necessary, can usually be obtained by warm water enemas. To lessen the severity of the local inflammations in the fauces and glands of the neck, besides the general remedies already mentioned, keeping the swollen parts covered externally by the continuous application of pounded ice inclosed in bladders, or light, soft rubber bags, during the first three or four days, will be found highly beneficial in the more active anginose cases. But if the ice is not at hand, or if the parents are too strongly prejudiced against cold applications, you can cover the swollen parts with cloths kept wet with an infusion of aconite leaves and muriate of ammonium. The infusion may be made by putting one litre (two pints) of water boiling hot on thirty-two grams (℥i) of aconite leaves, and sixteen grams (℥ss) of ammonii murias, in any convenient vessel, stirring them several times while cooling, and use it only milk warm. It really constitutes a cooling, narcotic, and discutient application, that I have used as an external application during the first three or four days, both in scarlet fever and diphtheria for many years, and with much apparent benefit.

For the inflamed parts in the fauces and throat, during the same stage of the disease, I know of no better application than a dilute solution of chlorate of potassium, containing a small proportion of hydrochloric acid and tincture of belladonna, used in the same manner as I directed when speaking of the treatment of diphtheria.* When the first stage is passed, and the fever and rash begin to decline, if the swollen glands remain hard and but little disposed to undergo resolution, the application, three times a day, of a liniment composed of three parts of camphorated soap liniment and one part of tincture of iodine, may be used instead of the infusion or ice. At the same stage, the internal use of the chlorate of potassium and belladonna solution should be exchanged for suitable doses of the tincture of the chloride of iron and quinine, both for their local effect on the throat, and tonic and antiseptic effect upon the system at large. In cases presenting unusual weakness and frequency of pulse, the administration of suitable doses of a solution containing liquor ammoniæ acetatis, tincture of digitalis and carbonate of ammonium, between the doses of the tincture of iron and quinine, may be given with great benefit. In the fulfillment of the fourth indication I have named, careful attention should be given throughout the whole course of the disease, and especially during its middle and later stages, to the administration of nourishments, of which good milk, thin wheat flour and milk gruel, and beef tea, are the best. They should be given in small quantities at a time, but repeated sufficiently often to supply a fair degree of nutrition. When the swelling or ulcerations in the throat are such as to render the swallowing of nourishment very difficult, a nutritive enema, consisting of milk or good beef tea should be given per rectum morning and evening. Such cases can be further sustained by applying, two or three times a day, over a large part of the cutaneous surface, cod-liver oil, holding in suspension a small quantity of sulphate of quinia. In the more malignant cases of scarlatina anginosa, in which incipient appearances of gangrene are presented in the fauces or tonsils, between the third and fifth days, I have been in the habit of ordering an infusion of four grams (℥i) of cayenne pepper in 130 cubic centimeters (fl. ℥iv) of boiling milk, and when cool, giving to a child five years of age, one teaspoonful every one

* See formula and directions on page 174.

or two hours, until the critical stage is passed and the sloughs separated, leaving clean, ulcerated surfaces, when the pepper is omitted, and only slightly astringent and soothing gargles used locally, with quinine, iron and nourishment internally.

In some cases of the more malignant grade of scarlet fever, accompanied by a high temperature, very frequent pulse, hurried breathing and dullness or drowsiness between the paroxysms of restless tossing, I have caused the whole surface to be thoroughly sponged with cool water every three or four hours and this to be followed by an application of cod-liver oil containing a small proportion of iodine; and apparently with decided benefit. It is not long since that I was called to a family on Fifteenth street, west of State street, where three children had been attacked with the fever in a very malignant form. One was already dead, having been sick only three days; another was dying; and the third, a little boy, who had sickened two days later than the other two, was rapidly developing the same symptoms, and the characteristic eruption had appeared thickly over the surface. He was put upon the use of such internal remedies as I have already indicated, and faithfully sponged with the cool water followed by the application of the iodized oil as just described. The spongings were followed by such marked improvement in the pulse, temperature, and nervous sensibility, as to leave no doubt of their beneficial effect. The case ran a severe course, but recovered without any bad sequelæ. Having indicated as clearly as possible the several objects to be accomplished in the treatment of the different grades and stages of scarlet fever, and the means I have found best adapted to the accomplishment of these objects, I will only remark further that the milder cases of scarlatina simplex need but little medicine of any kind. A moderate dose of the solution of chlorate of potassium, hydrochloric acid and belladonna* three or four times a day with the proper hygienic regulations, is all that is required in such cases.

Prophylaxis.—Isolation of the sick as far as practicable, and faithful attention to cleanliness, ventilation, and proper disinfection, constitute the best means for limiting the spread of the disease. Much has been written in relation to the efficacy of belladonna and other remedies to be given internally as preventives of scarlet fever. The fact that the period of incubation of this disease is not well-defined, coupled with the further important fact that many children who are fully exposed to contact with it, do not take the disease when no preventive means have been used, renders it very difficult to determine the actual value of any given drug when administered for this purpose. In cases where the date of exposure to the contagium is known, and the patient can commence immediately, or at least as early as the second day, the taking of fair doses of a solution of the hyposulphite of sodium with tincture of belladonna, three or four times a day until the time for active symptoms of the fever to begin had passed, I feel confident that the development of the disease would be either entirely prevented, or its attack rendered very mild. For a child five years of age, the dose of the hyposulphite should be from three to five decigrams (gr. v to viii) with tincture of belladonna 0.13 cubic centimeter (min. ii), dissolved in mint water.

Sequelæ.—Scarlet fever, more than any other one of the acute general diseases, is liable to be followed by troublesome and important sequelæ. Inflammation and suppuration in the middle ear, followed by perforation of the tympanum and a protracted purulent discharge from the external meatus, with more or less impairment of hearing, are of frequent occurrence both during the advanced stage of severe anginose cases, and

* See page 174.

during any part of the period of convalescence, from attacks even of the mildest character. The commencement of the inflammation is indicated by the occurrence of sharp, lancinating, or throbbing pains in the ear; an increase of fever and restlessness; and sometimes delirium.

These symptoms generally continue with increasing severity from two to four days, when a discharge commences from the external ear, followed by a rapid subsidence of the pain and fever. In many cases the discharge is at first a thin serous fluid, quite abundant in quantity, which subsequently diminishes and becomes more purulent; while in other cases it is a thick white pus from the beginning. In a large proportion of the cases, the discharge and the other local symptoms, cease altogether in from one to two weeks, leaving the hearing unimpaired; while in others it continues indefinitely and is accompanied by partial or complete destruction of the tympanum, and sometimes loss of one or more of the small bones of the ear, with partial or complete deafness. For the treatment of these cases I refer you to the lecture on otitis, in its various forms and stages. Another painful and sometimes protracted sequel is sub-acute rheumatism. It generally commences in the early part of convalescence, and is most apt to attack the wrists, ankles, and smaller joints of the hands and feet, but sometimes extends over nearly all the articulations of the extremities and trunk of the body, and even to the structures of the heart. It is best relieved by the same remedies that have been found effectual in similar grades of rheumatic inflammation, occurring unconnected with scarlet fever, and which are fully considered in the lectures on acute and chronic rheumatism.

But perhaps the most important and dangerous, if not the most frequent sequel of scarlatina, is some degree of nephritis or renal congestion, accompanied by more or less anasarca or general dropsy. During the active stage of the general fever, the urine is often found containing albumen and other evidences of renal congestion and irritation, which should never be overlooked or neglected by the attending physician. All the facts appear to show that there is some quality of the essential cause of the fever, which so influences the renal structures as to leave them during the convalescence, peculiarly susceptible or predisposed to inflammatory congestions of all degrees of severity. The common impression is, that the renal dropsies following scarlatina are caused by undue exposures to cold or going out too soon; but my own experience does not sustain that impression. On the contrary, a large majority of the cases which have come under my observation, have been in children who had been kept in rooms too warm and too little ventilated, and have used more or less of alcoholic remedies as a part of their treatment. The renal affections following scarlatina may commence at any time during the four weeks following the subsidence of the general fever; but much the larger number of cases are noticed between the third and tenth days after the beginning of convalescence. They vary much in severity, and mode of development, from a very acute and dangerous nephritis to a simple passive congestion sufficient to cause the exudation of albumen in the urine. But, as all these affections are fully considered in the lectures on acute and chronic nephritis, including the various pathological conditions causing albumen to be eliminated in the urine, it would involve unnecessary repetition to enter further into their discussion at this time. I will only add, therefore, that you should not only pay special attention to the renal secretion during the active progress of all cases of scarlatina, applying proper tests for albumen as often as every second day, but you should always instruct the patient or the nurse to keep close watch of the quantity and appearance of the urine until the

period of convalescence is passed. It is a good rule, in cases presenting albuminous urine during the active stage of the fever, to give all through the stage of convalescence, moderate doses of spirits of nitrous ether with tincture of chloride of iron, three times a day, well diluted with water.

LECTURE XXVI.

Rubeola—Rötheln—Roseola—Pertussis and Mumps—Their History, Causes, Symptoms, Diagnosis and Treatment.

GENTLEMEN: In this country the word rubeola has been pretty uniformly used to designate the disease called morbilli or measles. But in recent times many English and Continental writers (Aitken, Reynolds, Trousseau, Thomas in Ziemssen, etc.) have applied it to a hybrid disease known in this country as rötheln, or "German measles." By others the latter has also been called roseola; thereby producing much confusion in the application of names, and no little embarrassment to the student in his efforts to preserve a clear, differential diagnosis between these several milder exanthematous diseases. I shall adhere to the American custom of regarding rubeola, morbilli and measles, as synonyms, applicable to true measles only. The hybrid disease intermediate between scarlet fever and true measles I shall call rötheln; while roseola will be used to designate a very mild febrile affection, non-contagious, and characterized by the appearance upon the skin of red spots instead of exanthematous points.

Rubeola, or measles, is a contagious eruptive fever of much milder character than variola or scarlatina, and though not accurately differentiated from the latter, the description of it is easily recognized in the history of some of the epidemics that occurred in the early part of the Christian era. Like scarlet fever, it attacks mostly children and youth, though it may attack persons at any period of life; and suffering from it once usually destroys the susceptibility to the action of the specific cause through the remainder of life. Yet there are many who have had the disease twice or even thrice. Throughout the temperate zone, it is most apt to prevail in the transition seasons, spring and autumn, though no part of the year is exempt. While in enlightened countries where the nature of the disease is well understood, and reasonable attention is given to hygienic and sanitary measures, it is regarded as of but little importance; its introduction into some countries of less enlightened people, has been followed by a serious degree of fatality. For instance, an extensive prevlaence of the disease in Japan, in 1861, according to the statements of Dr. D. B. Simmers, destroyed 75,000 lives; and in the Fiji Islands, in 1875, it is said to have destroyed the lives of one-fifth of the entire population. The measles that prevailed quite extensively in some of the military camps for the rendezvous and training of recruits, during the late war in this country, was accompanied by a considerable ratio of mortality, owing chiefly, however, to pneumonic and typhoid complications.

Causes.—The predisposing causes that favor the development and spread

of rubeola, are youth, overcrowding and bad ventilation, uncleanliness, and damp, cold air. The essential cause is a specific contagium formed in the bodies of the sick, and eliminated chiefly through the skin and lungs, contaminating the air immediately around the patient, and capable of communicating the disease to other persons who breathe it, and capable also of becoming attached to clothing, and being transferred to other places. Like all the other contagiums and miasms, this has been regarded by modern investigators as composed of organic germs. Dr. J. H. Salisbury, of Cleveland, Ohio, claimed to have discovered the specific cause to be a species of fungus developed on damp straw, and thus attempted to explain the prevalence of the disease in some of the military camps connected with our army. His observations, however, were not confirmed by those of Drs. Hammond, Woodward, and others, who gave special attention to the subject; and it is highly probable that the irritation of the air passages and slight fever, sometimes produced by the fungus developed on damp straw, is entirely distinct from true measles. That the specific cause or contagium is developed in the blood of patients laboring under the disease, is proved by the results of inoculations, by which the disease is readily communicated.

Symptoms.—After an incubative stage varying from nine to fourteen days, the active symptoms commence with slight alternations of heat and cold accompanied by some headache, a general sense of weariness, moderate heat of skin, slight acceleration of pulse, a marked sense of tightness or oppression in the chest with dry harsh cough, fullness and dryness of the nostrils, red and watery appearance of the eyes, and flushing of the face. In other words, all the usual symtoms of an attack of influenza, or a severe "common cold." All these symptoms gradually increase in severity until the evening of the fourth day, when generally there is much redness of the face and eyes, sensitiveness to light, a severe hoarse rough cough sending a sore pain through the anterior part of the head and temples, with very decided soreness and sense of oppression in the chest; moderate fullness and acceleration of pulse; temperature from 39° to 40° C. (102° to 104° F.); and scattered over the face and upper part of the chest an eruption of small red points, a little larger than the points or exanthems of scarlatina, and more irregular in distribution; there being in some places two or more points clustered together, and in others but one, leaving the skin of natural color between them. There are no hard elevated papules either with or without vesicles, but simple red points hardly perceptible to the touch as the finger is passed over them.

The eruption thus commenced on the face, neck and chest, rapidly extends over the whole cutaneous surface, reaching the extremities about the end of the fifth day, or twenty-four hours later than its appearance on the face. All the local catarrhal and general febrile symptoms continue unabated until the third day of the eruption, or the seventh from the commencement of active symptoms, when the disease has reached its climax, and the next day both the fever and rash have notably diminished. All the symptoms now decline steadily, until convalescence is fully established, generally between the tenth and twelfth days from the commencement of catarrhal symptoms. The disappearance of the rash is followed by slight desquamation or roughness, but not so much as after scarlatina; and a moderate bronchial cough often lingers through the convalescence. The general character of the symptoms, and the order of their occurrence in measles, are more uniform than in any of the other eruptive fevers. You will meet with some cases, however, in which the febrile symptoms and the amount of the eruption will be less than I have described, and others

in which they are more severe. In some of the latter class, at the time of the appearance of the eruption, the temperature may rise to 40.5° or 41° C. (105° or 106° F.); the eruption over the face and neck so thick as to make the whole surface red, and the eyes so irritable that the patient will not open them to the light. The soreness in the chest, and cough, are very severe, with tenacious mucous expectoration, and such a degree of nervous disturbance as to cause some delirium, especially in the night. A very small proportion of these unusually severe cases present a decidedly malignant aspect. Such cases, in addition to the high temperature, and other severe symptoms just named, present a frequent and feeble pulse; irregular and oppressed breathing; and generally more or less of petechial or hemorrhagic spots in connection with the eruption. The extravasated blood is dark, purplish color, and gives to the cutaneous surface a peculiarly dark and spotted appearance, which has given origin to the name of "*black measles.*" The petechial spots more frequently appear over the abdomen, inside of the thighs and legs, but may extend to the face, and other parts of the surface, and are sometimes accompanied by hemorrhage from the mouth, gums, nostrils, or from the mucous membrane lining the stomach and lower bowels. It is only a few months since I saw a case of this kind, in the person of a young woman, which terminated fatally on the third day after the appearance of the eruption.

Diagnosis.—Rubeola is distinguished from all the other eruptive fevers by the presence of the severe catarrhal symptoms from the beginning. From variola, varioloid, and varicella, it is further distinguished by the absence of all elevated and hard pimples and vesicles, and instead, the presence of small red points or exanthems, which differ from those of scarlet fever in being irregularly distributed in clusters instead of uniformly diffused over the cutaneous surface.

Prognosis.—Except the very few cases of a special malignant character uncomplicated cases of measles uniformly tend to recovery; consequently the ratio of mortality resulting from its prevalence is very small. Yet you will find in the annual statistics of mortality, quite a number of deaths attributed to measles. Judging from my own observations, I should say that three out of every four of these deaths were caused by the supervention of broncho-pneumonia during the eruptive stage of the general fever. This complication is most apt to occur in young children, and in such adults as are living in overcrowded or badly ventilated places. In the latter class of cases dysentery is also liable to occur, especially in the advanced stage of the fever, and sometimes is sufficiently severe to cause the death of the patient. It was the supervention of pneumonia and dysentery as complications, that caused nearly all the deaths resulting from the prevalence of measles in the military camps during the recent war in this country. Another complication that occasionally occurs, though less frequently than in connection with variola and scarlatina, is general convulsions. Such attacks are most apt to occur in children under five years of age, and just at the stage when the eruption is first beginning to appear on the surface.

Pathological Anatomy.—As this disease rarely terminates fatally, except when influenced by some important complication, so there are no structural changes to be found after death peculiar to measles, except the eruption which appears on the mucous membrane of the air passages, causing the catarrhal symptoms, and subsequently upon the cutaneous surface. This does not differ anatomically from the efflorescence in scarlatina, which I described sufficiently in the preceding lecture.

Treatment.—As rubeola is a self-limited disease, tending generally

to the recovery of the patient, there is no need of very active medication. The same attention should be given to the temperature, cleanliness, and ventilation of the sick-room as in scarlatina; and the same avoidance of hot stimulating drinks and excessive clothing. As we know of no specific remedy capable of destroying the contagium or essential cause so as to arrest the progress of the disease in its early stage, the chief objects to be accomplished are, to lessen the severity of the cough and soreness in the chest, and promote natural secretory actions. To mitigate the cough and other catarrhal symptoms, I have found the following combination one of the best:

℞			
	Syrupus Scillæ Compositi	45 c. c.	℥iss
	Tincturæ Sanguinariæ	15 c. c.	℥ss
	Tincturæ Opii Camphoratæ	60 c. c.	℥ii

Mix, and give to an adult four cubic centimeters (fl ʒi) every three or four hours, in a tablespoonful of water. In cases accompanied by very severe headache, 16 grams (ʒiv) of potassium bromide may be added to the formula with advantage. Or if, as sometimes happens, the fever is unusually severe, the addition to the same formula of four cubic centimeters (fl. ʒi) of the tincture of veratrum viride, will render it more efficient in relieving the patient during the first three or four days, or until the crisis of the disease is passed. During the first three days of treatment, if the fever is active, tongue coated, and urinary secretion scanty, I give an anodyne dose of the compound powder of opium and ipecac (Dover's powder) with from six to twenty centigrams (gr. i to iii) of calomel each night and follow it by some mild saline laxative in the morning. In the milder cases this is not necessary. After the third day of the eruption, in the great majority of cases, no other medicine is required than a mild anodyne expectorant three or four times a day until the cough disappears. Those rare cases of a malignant or hæmorrhagic character, when encountered, must be treated in the same manner as I indicated when speaking of the management of cases of malignant variola. If capillary bronchitis, lobular pneumonia, or other local inflammations supervene as complications during the progress of any grade of rubeola, they must be treated in the same manner as similar grades of inflammation occurring under other circumstances.

Sequelæ.—The most frequent and important diseases observed to follow attacks of measles, are chronic inflammations of the conjunctiva and tarsus of the eyelids, chronic bronchitis, scrofulous adenitis, and phthisis. It is probable that these results are restricted mostly to persons who possessed some degree of hereditary predisposition to scrofula or tuberculosis, prior to the attack of the eruptive fever. But there appears to be something in the nature of the changes produced in the blood and the properties of the tissues during the progress of measles that directly increase these predispositions and strongly tend to convert them from a latent to an actively developing progress. For this reason, we find many cases of well-developed phthisis, particularly between the ages of twelve and twenty years, in which the cough is very definitely dated back to the time when they had the measles. For the purpose of more effectually preventing such results, the attending physician should look closely both to the family tendencies and the individual temperament, in all cases of this form of eruptive fever. And when either scrofulous or tuberculous tendencies are discovered, as soon as the febrile stage is passed and convalescence commenced, the patient should be put at once upon such remedies and diet as are best calculated to counteract such tendencies. Among

the remedies usually resorted to, I know of none better for this class of cases, than a mixture of two parts of the syrup of iodide of calcium with one of fluid extract of hops, given in doses of three to six cubic centimeters (fl ʒss to ʒiss), according to the age of the patient, and repeated after each meal-time. The lacto-phosphate of calcium, the compound syrup of hypophosphites, and cod-liver oil, may be used for the same purpose. As far as possible, such cases should live in dry, well-ventilated rooms; take plenty of plain, easily digestible food, and moderate but habitual out-door exercise. When some degree of cough, with moderate loss of flesh, continues for some time after convalescence is completed, a change to a mild, dry climate is very desirable.

RÖTHELN.

History.—From the close of the fifteenth century, at which time Ali Abbas described an exanthematous epidemic prevalent in Venice, to the present time, it is possible to find evidence of the existence of a contagious eruptive fever, closely resembling in many respects scarlatina and rubeola and often confounded with them, but really distinct from both. During the last half of the eighteenth century, the disease was described by German physicians under the name of rubeola, while during the same period in France and England it was described under the name of roseola, and in this country it was called German measles, false measles and rose rash. In 1874 it prevailed as an epidemic in New York City, and was accurately described by Dr. J. Lewis Smith in the Sanitarian for July, 1874. Since that time it has made its appearance in many places throughout the Middle, Southern and Western States. It prevailed quite extensively in Charleston, S. C., in the early part of 1880; in Philadelphia and New York, in the winter of 1880–81; and during the latter period and the spring of 1881, it was prevalent in Chicago, and in several places in Indiana, Illinois, Michigan, Missouri, and Nebraska.

Its prevalence in Chicago was well described by Drs. C. W. Earle and Roswell Park, in brief papers read to the meeting of the Illinois State Medical Society in May, 1881.*

Causes.—Nothing is known concerning the etiology of this disease, except that it appears to prevail most under the same conditions of climate, season and sanitary regulations that favor the prevalence of measles and scarlatina, and that it is propagated by a specific contagium entirely distinct from the contagiums of both the diseases just named. Its independent character is proved by the fact that it attacks those who have previously had measles and scarlet fever as readily and severely as it does those who have never had either. This fact was fully illustrated in the cases observed by Dr. Park, as described in the paper already alluded to. A large majority of his cases were observed among the inmates of the Protestant Orphan Asylum in this city, where, out of 140 children, 95 were attacked with rötheln, a large proportion of whom had suffered attacks of true measles in the same institution only one year previous. That age exerts a predisposing influence is shown by the fact that three-fourths of all the cases noted have occurred between the ages of two and fifteen years. Of 130 cases observed by Emminghaus, only six were adults; of the 95 cases seen by Dr. Park in the asylum, two were adults; while of 54 cases seen by J. Lewis Smith, six were adults.

Symptoms.—After a period of incubation, not very accurately ascertained, but of two or three weeks duration, the disease called rötheln commen-

*See Transactions of the Illinois State Medical Society for 1881, pp. 292–301.

ces, with very little primary fever; generally one day of slight feelings of indisposition, such as moderate headache, sense of weariness, and sensitiveness to atmospheric changes; and then an efflorescence of red points begins to appear on the surface of the neck and upper part of the chest, and rapidly extends over most of the cutaneous surface, accompanied by some itching or tingling, with slight stuffing of the nostrils and redness of the eyes. The pulse is only slightly increased in frequency, and the temperature elevated not more than from one to three degrees above the natural standard. In some cases there is moderate redness and soreness of the fauces, with swelling of the glands in the neck, but not in all. The eruption, or rash, is neither papular nor vesicular, but consists of small red points intermediate between those of measles and scarlet fever, being smaller and less clustered in groups than the former, and less numerous, with more natural colored skin between them than the latter. The eruption and general symptoms usually increase moderately for one or two days, and then begin to decline with such rapidity that most of the patients may be regarded as convalescent at the end of the first week. I have seen a few cases, however, in which the soreness of the throat and inflammation of the glands behind and beneath the angles of the jaw, were sufficiently severe to protract the sickness until the end of the second or even into the third week.

Prognosis.—From the description I have given, you will infer that the disease called rötheln is a very mild form of exanthematous fever, of short duration, and uniformly tending to recovery. I have seen no fatal cases, and none followed by important sequelæ. Of the one hundred cases reported on by Dr. R. Park, and the forty mentioned by Dr. Earle, as occurring under their observation in this city in the winter and spring of 1881, none proved fatal. In a very small number of cases, pneumonia, and gastric and intestinal irritations have occurred as complications, but not in sufficiently severe form to cause a fatal termination.

Diagnosis.—The only diseases with which rötheln is likely to be confounded are, rubeola, scarlatina and roseola. From the first it is readily distinguished by the almost entire absence of premonitory or primary fever, and of all bronchial cough or severe catarrhal symptoms; from the second, by the absence of primary fever, the very slight disturbance of pulse and temperature, and the less uniform diffusion of the rash over the whole cutaneous surface; from the third, by the fact that the eruption is in the form of small red points, while in roseola the eruption is in red spots, varying in size from the circumference of a small pea to that of a dime.

Treatment.—The great majority of cases of rötheln require only rest and proper attention to the hygienic conditions connected with the patient. A few of the more severe cases may be treated in the same manner as I have advised for *scarlatina simplex.*

ROSEOLA.

Clinical History.—The disease properly called roseola frequently occurs simply as a complication of other affections, as gastric derangements, articular rheumatism, the primary fever of variola and varioloid, and as the result of taking certain kinds of food and medicines, as strawberries, shell-fish, balsam copaiba, iodide of potassium, oil of turpentine, etc. In these cases it has been styled roseola symptomatica, and requires no attention except that which relates to a removal of its cause. The disease is also met with occasionally as a mild idiopathic febrile affection,

of brief duration and devoid of danger to the patient. It is neither contagious nor communicable by inoculation, but sometimes prevails as an epidemic. The initial stage is usually from one to three days' duration, and characterized by moderate dull pains in the head, back and limbs, with only a slight increase in the frequency of the pulse or elevation of temperature, and but little disturbance of the secretory functions. On the second or third day the eruption appears nearly simultaneously on the body and extremities, in the form of simple red spots, varying in size from two to ten millimeters in diameter, not elevated, and from which the redness temporarily disappears on pressure. The color varies in different cases from a bright red to a purplish hue. These rose spots are accompanied by only a very slight sense of heat or itching, and they generally disappear in two or three days, without leaving desquamation or roughness, and the patient is convalescent. In a few instances the convalescence is delayed a few days by the eruption appearing in two or three successive crops two or three days apart. Careful attention to the brief description I have given will enable you to distinguish it from all the other eruptive fevers. It is not often accompanied by any important complications, neither is it followed by any characteristic sequelæ.

Treatment.—A large majority of the cases require only proper attention to the hygienic conditions influencing the patient, but when called to the more active class of cases, I have generally directed from four to six grams (℥i to ℥iss) of the bi-tartrate of potassium to be dissolved in a tumblerful of cold water, to which a little sugar may be added, and a tablespoonful of this solution taken every two or three hours, until the urinary secretion becomes free in quantity and the bowels a little relaxed. In malarious districts it may be well to give the patient a moderate dose of sulphate of quinia once or twice a day during the convalescence.

PERTUSSIS.

Pertussis, or whooping-cough, though not an eruptive fever, is, nevertheless, a specific, contagious affection, self-limited in duration, and attacking chiefly children and youth. It has been recognized and accurately described from an early period in medical history. Though prevailing chiefly among children, and occurring but once in the same individual, yet no age is exempt from liability to an attack, and second attacks in the same person are occasionally met with.

Causes.— It is probable that whooping-cough arises solely from a specific contagium, generated in the bodies of those affected with the disease, and emitted with the breath from the air passages, and, perhaps, with the exhalations from the skin also, during the whole active progress of the disease.

Of the special nature of this contagium we have no satisfactory knowledge. In 1871, Setzerich claimed to have discovered fungoid germs in the epithelium of the air tubes, which he was disposed to regard as the specific cause.* Somewhat similar observations have been made by Buhl, Oertel, and a few others, but not sufficient to show either the uniformity of the presence of such germs from the beginning of the disease, or their causative agency when they are present. A large majority of the cases occur in children under eight years of age; the susceptibility to the action of the contagium apparently diminishing with the advance of age from eight years upward. Statistics also show a larger number of attacks in females

* See Quarterly Journal of Microscopical Science, April, 1871.

than in males. It may occur at any season of the year, and in any climate, but epidemics have been observed to occur more frequently in the transition seasons of the year.

Symptoms.—After a period of incubation, varying from one to two weeks, the initial symptoms develop gradually, and consist of slight general fever, the temperature being from one to three degrees above natural, skin dry, face flushed, pulse from ninety to ninety-five per minute ; a sense of tightness and soreness in the chest, hoarseness, and a moderate degree of cough. In some cases the symptoms commence with chilliness, followed by headache, in addition to the other symptoms just named. The aggregate of symptoms I have named usually increase through the first week, at the end of which the general febrile phenomena have reached their acme ; the local soreness in the chest and air passages has increased ; and the cough has become more frequent, and shows in a more marked degree the characteristic feature, which consists in a rapid succession of short, quick, spasmodic coughs, without inspiration, until the collapse of the chest is complete, when the inspiratory act is caught full, either with or without a loud, stridulous sound, called the *whoop*. No sooner, however, is the chest again filled by the inspiration than another succession of rapid coughs occur, until the air is exhausted and the face becomes very red, when another protracted inspiration re-supplies the exhausted air cells. At this stage the paroxysms of coughing usually consist of only one or two series of these rapidly repeated acts of coughing, ending in a prolonged inspiration, with congestion of blood in the face and eyes during the paroxysm. The expectoration is still scanty, tenacious, and difficult to dislodge. During the second week the general febrile symptoms remain stationary, or rather decline, but the paroxysms of coughing steadily increase in frequency and severity, until, at the end of the week, each paroxysm consists in three or four series of the very rapid, spasmodic hacks or coughs, with the rough, stridulous, whooping inspiration between them, until the face becomes turgid and even purple, and the little sufferer appears extremely weary. Sometimes, especially in very young children, the severe paroxysms of coughing and strangling end in a reversal of the action of the stomach, and free vomiting.

Yet in a few minutes the fullness and redness of the face subsides, the feeling of weariness passes away, and the patient resumes his play and cheerfulness until the approach of the next paroxysm. During the third week, although there remains no fever and but little derangement of the secreting and excreting functions, yet the paroxysms of coughing maintain their frequency and full degree of severity, causing the face to look constantly more or less bloated and puffy around the eyes; the expectoration more abundant and opaque or puruloid, and the patient to look weary, pale, and somewhat emaciated. With the close of the third week, the disease generally begins to decline.

The paroxysms of coughing become gradually less frequent and severe; the appetite begins to improve; the mind is more cheerful; the sleep at night more continuous; and by the end of the fifth or sixth week all the characteristic symptoms of the disease have disappeared. When left to pursue its own course, the average duration of whooping-cough is five or six weeks; but I have seen very mild cases terminate in three, and unusually severe ones continue from nine to twelve weeks. While the symptoms I have detailed are those which essentially characterize the several stages of the disease, particular cases present additional symptoms and complications requiring attention. In some, during the first one or two weeks which constitute the febrile stage, the soreness in the chest,

shortness of breath, and frequency of pulse, are accompanied by a mixture of moist and dry rales in one or both sides of the chest, without dullness on percussion, and indicate an unusually active bronchitis. When those same symptoms are accompanied by a still higher febrile heat, a short expiratory act, and some dullness over certain portions of the chest, they indicate bronchitis with lobular pneumonia, a dangerous complication, more frequent in very young children, than in older patients. When the cough reaches its greatest severity, which is generally during the third week, the protracted repetition of the act of coughing forces the expiratory act to such extreme that the circulation is temporarily arrested in the pulmonary capillaries, causing fullness of the right cavities of the heart, distension of the veins of the neck and face, giving rise, not only to the turgid and swollen condition of the face, but in some free bleeding from the nose; in others vertigo, with great sense of exhaustion for a few moments after each paroxysm; and in a very few, general convulsions.

The last named accident or complication seldom occurs except in such children as are hereditarily predisposed to scrofula or phthisis. I have seen a few cases of this class, in which there occurred an occasional convulsion, and in the fourth and fifth weeks they become pale and much worn; the eyes lost their paralellism, they became subject to frequent spells of choking, accompanied by spasmodic movements of the eyeballs, and when the fontanelles had not fully closed, the head slowly enlarged, showing unmistakeable evidence of serous effusion between the pia mater and arachnoid membranes. Such cases usually terminate fatally.

Prognosis.—Very few cases of uncomplicated whooping-cough terminate fatally. Cases have been reported in which death appeared to result from suffocation or direct collapse of the lungs during the violent paroxysms of coughing. In other cases the strong determination of blood to the head during the coughing has induced such a degree of capillary congestion of the brain as to cause speedy death from apoplexy or paralysis. No cases of this kind have come under my observation, and I apprehend their occurrence is very rare. Most of the deaths attributed to whooping-cough in the bills of mortality are the result of capillary bronchitis, pneumonia, or cerebral disease.

In the summer season, the disease in young children often becomes complicated with ilio-colitis or serous diarrhœa, under the influence of which they emaciate rapidly and sometimes die from exhaustion.

Diagnosis.—During the first or febrile stage of whooping cough, the symptoms are so much like those of a sub-acute bronchitis, that it is not always easy to make a positive diagnosis. But generally the cough and fever, even during this stage, are out of proportion to the physical signs of bronchitis. And a little later, when the fever and the physical signs of bronchitis are both declining, if the paroxysms of coughing are increasing in severity, and assuming more the spasmodic, rapid repetitional character, there can be no doubt concerning the true nature of the disease.

Special Pathology.—That the contagium or specific cause of the disease develops its morbid effects mainly upon the par vagus and pneumogastric nerves, there can be no doubt. And yet there is also a certain degree of irritation of the bronchial mucous membrane, so uniformly present as to constitute a necessary part of the pathological conditions constituting the disease. In some fatal cases, some of the bronchial glands were found enlarged, which gave rise to the idea that all the phenomena of the disease were caused by the pressure of such enlarged glands on the nerves. But there is no proof that such enlargements generally exist in cases of this disease, or that when observed they are any more than accidental complications.

Treatment.—Viewing the disease as an irritation of the nerves just mentioned, and of the bronchial mucous membrane, caused by a specific poison, for which we know of no reliable antidote, the practical indications for treatment are, to lessen, as far as possible, the irritative effects of the specific cause on the nervous and membranous structures involved, and to prevent the more important complications. During the febrile stage, embracing the first one or two weeks, I have long been in the habit of using the following combination :

℞	Syrupus Scillæ Compositi,	45 c. c.	℥iss.
	Tincturæ Sanguinariæ,	15 "	ʒss.
	Tincturæ Opii Camphoratæ,	60 "	℥ii.
	Potassii Bromidi,	15 grams	ʒss.

Mix. Of this I give to children five years of age, 1.33 cubic centimeters (min. xx) every three, four, or six hours, according to the activity of the symptoms, and to adults, four cubic centimeters, or (fl. ʒi.) at the same intervals. Each dose should be mixed with a little additional sweetened water when taken. In this mixture we have a mild anodyne expectorant, well calculated to allay bronchal irritation, and an efficient sedative to nervous excitability. In cases presenting a coated tongue, dry skin, high colored urine, with considerable elevation of temperature, I give a single dose of thirteen centigrams of calomel (gr. ii.) with two decigrams of sodium bicarbonate (gr. iii.) for a child from four to six years of age, and if it does not move the bowels freely in six or eight hours, follow it by some mild laxative, and subsequently give a moderate dose of quinine each night and morning. After the first two weeks have passed and the paroxyms of coughing have assumed their full spasmodic character unaccompanied by general fever, I have found no remedies more efficient in lessening the severity of the paroxyms, and shortening the duration of the disease, than belladonna, given in such doses and at such intervals as to keep its effects just below that which would dilate the pupils and cause unpleasant dryness of the mouth and throat, and one moderate anti-periodic dose of sulphate of quinine each morning and evening. A great variety of remedies have been recommended, such as chloral hydrate, ammonium, bromide, lobelia, musk, camphor, cochineal, nitric acid, nitrite of amyl, and the inhalation of various anodyne or anti-spasmodic vapors; and when judiciously used, nearly all of them are capable of doing some good. If during all the middle and later stages of the disease, you so direct your remedies as to sustain the tone of the digestive organs, ward off important complications, and keep the patient moderately under the influence of quinine and such anti-spasmodics as more especially lessen the excitability of the respiratory system of nerves, you will rarely fail to conduct your patients to a good and comparatively early convalescence. After the first week, or the stage of most fever, the patients should be allowed a liberal diet of plain food; encouraged to go out freely in the open air, taking care only that they be so clothed as to protect them as well as possible from sudden and severe atmospheric changes; but they should never be kept closely confined within doors or shut up in over heated-rooms. If complications, such as pneumonia, gastric and intestinal irritations, cerebral congestion or convulsions, occur, they must be treated on the same principles, and with the same remedies as would be appropriate for these several affections under any other circumstances. A certain degree of sensitiveness of the stomach, giving rise to ready vomiting during the more severe paroxysms of coughing, is present in ma-

ny cases, especially in young children, and instead of being prejudicial, rather cuts short the paroxysms and helps to relieve the patient.

Sequelæ.—The more important affections liable to follow whooping-cough are, phthisis, emphysema, chronic capillary bronchitis, scrofulous enlargement of the glands of the neck, and hydrocephalus. When these affections become actually devoloped, their management, hygienic and medical, must be the same as would be proper under any other circumstances.

But much can be done during the later stages of the disease and through the ordinary period of convalesence to prevent the development of these affections if due attention is given at the proper time. It is chiefly in children and young persons who are predisposed, by hereditary influences or otherwise, to scrofula or tuberculosis that we find the diseases named as sequelæ of whooping-cough. Consequently, whenever called to patients with such predispositions, the practitioner should be on the alert and commence as early as practicable to counteract the unfavorable tendency by the use of such remedies as the hypophosphites, extract of malt, cod-liver oil, a change of air, aud all those hygienic influences that are calculated to improve nutrition and the general tone of health.

MUMPS.

Parotitis contagiosa, or mumps, is a mild, febrile affection, accompanied by a specific or peculiar grade of inflammation of the parotid glands, running a definite self-limited course, and dependent for its propagation on a contagion generated in the bodies of the sick. Of the nature or form of such contagion nothing is definitely known. The disease has often prevailed in an epidemic form, attacking large numbers in a community within a limited period of time. The period of life most susceptible to its attacks is from fifteen to thirty years of age. Males are more susceptible than females. Cases have been observed at all periods of life, from infancy to old age. The disease very rarely attacks the same individual a second time.

The period of incubation between the reception of the poison and the commencement of active symptoms, is variously stated, from one to three weeks, but I think it is in the great majority of cases between nine and fourteen days.

Symptoms.—The active symptoms are usually ushered in by slight chilliness, followed in a short time by moderate general fever, indicated by some pains in the head, back, and limbs; increase of one or two degrees in temperature; some increased frequency of pulse; lessening of cutaneous and urinary secretions; and generally slight feeling of soreness or stiffness of the parts behind the angle of the jaw. In from twelve to twenty-four hours after the commencement of the general symptoms, a distinct swelling, accompanied by some pain and tenderness, appears in one or both of the parotid regions, caused by an inflammation of the parenchyma of the gland itself. The swelling and other local symptoms increase for two days, when the disease is at its height. The swollen gland stands out prominently behind the angle of the jaw, lifting out the lobe of the ear and obstructing the opening of the mouth. Deglutition is also more or less impeded and often accompanied by sharp pains darting in the direction of the ears, especially in swallowing acid substances. During the third, fourth and fifth days, more or less serous infiltration takes place into the areolor tissue, around and below the parotid gland, adding to the area of swelling and giving it a semi-œdematious feel, more particularly in the sub-maxillary region. By the end of the fourth day the general

febrile symptoms have usually disappeared, and the decline of the local inflammation and swelling follows with such rapidity that the patient is fully convalescent at the end of the week. In some cases the inflammation attacks only one parotid gland first, and when this has nearly completed its course, the other gland becomes involved in the same manner, and the sickness is thus prolonged through the greater part of the second week.

In rare instances an inflammation, similar to that of the parotid gland, attacks one or both testicles in the male, and the mammary glands and ovaries in the female. It is generally supposed that these erratic or misplaced inflammations result from a sudden recession or transference from the parotid to the other parts; but in the very few cases that have come under my observation, the orchitis supervened, while the inflammation and swelling was still progressing in the parotid regions as usual. When the testicles are attacked they become painful, very tender to the touch, and much swollen, and the general febrile symptoms are much increased. In one case, to which I was called about the fifth day after the commencement of the disease, I found both parotid regions still swollen, hard and tender, and both testicles were swollen to three or four times their natural size, accompanied by high fever and some delirium. The inflammation of the testicles usually increases in intensity during the first three days, remains stationary one or two days, and then rapidly declines, leaving the organs in most instances in their natural condition, but sometimes atrophied and impaired in function. I have not met with a case of mumps in which the mammary glands or ovaries were attacked with inflammation; and, though such cases are on record, I think they occur very rarely. Equally rare is it that the inflammation is transferred to the brain, producing all the symptoms of acute meningitis.

Diagnosis.—The diagnosis of this disease is not generally difficult. It is distinguished from ordinary cases of adenitis or inflammation of the glands of the neck, first by the occurrence of distinct general febrile symptoms preceding the local swellings, and second by the location and shape of the swelling itself. The swelling in mumps, consisting principally in an enlargement of the whole parenchyma of the parotid gland, not only bulges out directly behind the ramus of the jaw, but soon somewhat overlaps a little the ramus and always lifts out the lobe of the ear. The latter is peculiar to swelling of the parotid gland; and, as acute inflammation and rapid swelling of this gland is very rare, except when caused by the contagion of mumps, it affords a reliable diagnostic mark of that disease.

Prognosis.—I have never known a case of this disease to terminate fatally. Its tendency is uniformly towards recovery, unless it becomes complicated with meningitis or inflammation of some other important internal organ. It is not often that the disease is followed by important sequelæ. Atrophy of the testicle sometimes follows the acute stage of orchitis, and sometimes, though very rarely, suppuration takes place, forming abscesses in the testicles. This last result occurs only in such patients as are strongly predisposed to scrofula or tuberculosis.

Treatment.—In simple uncomplicated cases of mumps, no general medication is required. Simply remaining within doors to avoid exposure to fatigue and cold, as well as to prevent communicating the disease to others, is desirable in all cases. The swollen glands may be bathed often with a liniment composed of three parts of camphorated soap liniment and one part of tincture of belladonna; if there be much headache and restlessness, a fair dose of bromide of potassium may be given every evening, and on the second or third day, if the bowels have not moved, a mild saline laxative may be given with advantage. The diet should be light

and unstimulating during the active progress of the case, but the same as ordinary after convalescence commences. This, gentlemen, completes the consideration of the very important class of acute general diseases. At the next lecture hour I shall commence the discussion of chronic general diseases, better known as constitutional affections.

LECTURE XXVII.

Chronic General Diseases—Diseases included under this head—Circumstances common to them all—General Etiological and Pathological considerations concerning them—General Treatment etc.

GENTLEMEN: Having completed the consideration of the acute general diseases, I now invite your attention to the second division of general diseases called chronic or constitutional affections. Under this head belong scrofula, tuberculosis, leucocythæmia, pernicious anæmia, Addison's disease, carcinoma, constitutional syphilis, rheumatism and gout.

Diverse from each other as some of these diseases may appear to be, they nevertheless have a sufficient number of circumstances in common to justify their being grouped together.

First. They are all characterized by a very persistent, if not permanent, alteration of the natural properties of the tissues, giving rise to certain morbid tendencies or predispositions to the development of special local affections both of a functional and structural character.

Second. They are all capable of being transmitted from parent to child—in other words, of being perpetuated by hereditary influence.

Third. So far as relates to the general or constitutional morbid condition, there is no tendency to a self-limited duration.

Fourth. They all arise from causes acting with feeble intensity, but persistently, through long periods of time, and of such a nature as to modify one or both of the elementary properties of living, organized matter.

In all these particulars, this group of constitutional diseases stand in direct contrast with the class of acute general diseases which we have already passed in review. You have observed that, in all the latter, the morbid manifestations are of an active character, leading rapidly to functional and structural changes of limited duration, are incapable of hereditary transmission, and arise from causes acting with more intensity, but of limited duration, one full impression of which often destroys the susceptibility to any further action of the same cause. On the contrary, the diseases I am about to discuss, are based on such changes in the properties of the primary organic molecules entering into the various structures of the body, as give such molecules certain tendencies to deviate from the natural standard or type of development, leading, if not counteracted by adverse influences, sooner or later, to such alterations in the molecular movements constituting nutrition and disintegration as to develop structural changes, consisting of local hypertrophies, atrophies, tissue degenerations, or morbid growths, according to the degree and direction of the primary deviations.

So slight and occult are the original changes in the properties of the organic atoms or cells that the constitutional vice or defect may exist for years without any appreciable structural changes, as we see in those hereditarily predisposed to pulmonary tuberculosis, carcinoma, etc., and yet if at any time during the life of such individuals, ordinary exciting causes chance to induce local irritation or inflammation, the presence of the latent or constitutional condition is made manifest by the unusual persistence of the local morbid action and the special tendency to degenerative changes in the exudations or other products resulting therefrom. For instance, a child possessing the scrofulous diathesis or constitutional condition, if exposed to a current of cold air upon the neck may have inflammation, exudation, and tumefaction of the lymphatic glands, ending either in permanent hypertrophy, caseous degeneration, or destructive suppuration; when the same cause provoking a similar degree of inflammation in a strictly healthy child, would have caused but a temporary exudation and swelling, to be followed in a few days by resolution and a return to the natural condition. So an adult with the tuberculous diathesis or constitutional condition, attacked with pneumonia followed by the usual exudation, will be likely to have such exuditive material, undergo either purulent degeneration constituting diffuse suppuration, or caseous degeneration and early phthisis, instead of resolution and re-absorption, as usual in subjects previously healthy.

That the primary and essential pathological condition constituting a chronic general disease, constitutional vice, cachexia, or diathesis, as it is variously called by different authors, consists in a morbid condition of one or both of the inherent properties of organized living matter* is proved both by its liability to hereditary transmission, and its persistence indefinitely with a well-known tendency to develop, sooner or later, specific nutritive changes in some of the structures of the body. As the germinal cell or aggregation of bioplasm furnished by the female, and the spermatozoa furnished by the male, are both living organized materials, it is reasonable to suppose that they will partake of the same properties, whether perfect or imperfect, that belong to all the other organized atoms of the bodies in which they were developed; and consequently in their independent subsequent growth, they will generally develop the same morbid tendencies as were possessed by the parent. The modifications of the properties of the germ may be so strong as to lead to manifest errors of nutrition during the development of the fœtus in utero, or at any time during the period of subsequent growth, or so feeble as not to cause their appearance until after the climax of adult life in the early stage of physical decline. While the essential pathology of all this class of diseases consists in some modification of the elementary properties that govern the molecular changes constituting nutrition and growth, these modifications not only differ in degree in different cases in the same constitutional affection, but they also differ in kind or direction in each affection from all the others; so that the local manifestations of disease developed from time to time during the progress of any given case, are peculiar to the special constitutional affection to which the case belongs.

For instance, the general morbid condition constituting scrofula, never gives rise to the local, functional or structural changes characteristic of syphilis, carcinoma, or leucocythæmia and *vice versa*. Neither do you find the rheumatic constitution giving rise to the local inflammations of gout, or

*See Lecture VI of the present course, pp. 48–9.

the reverse. This affords further proof that the primary or fundamental pathological condition consists in some deviation from the natural condition of the properties inhering in the organized tissue elements, inasmuch as it shows obedience to the universal law of living matter, namely, that like begets like. It is true, that constitutional syphilis may be established in a subject already scrofulous, or by a sufficient exposure to the proper causes and modes of living, gouty affections may be engrafted upon a previously rheumatic diathesis; but this in no proper sense invalidates the law just stated in regard to the fixed tendencies of each constitutional disease. Another fact of much pathological importance is, that the local affections which are liable to appear during the unrestrained progress of any one of the general diseases included in the class under consideration, are not accidental complications, but natural or necessary outgrowths resulting from the progress of the constitutional vice. They may be hastened in their appearance, or rendered more severe by the intervention of special exciting causes, or the influence of bad sanitary conditions. And, on the other hand, their development may be retarded or entirely prevented by the combined influence of good climatic, hygienic and sanitary regulations.

And yet, in a large majority of cases, it is the local morbid developments that chiefly occupy the attention of the patient, and on account of which he seeks the aid of his physician. The local developments resulting from the progress of the scrofulous diathesis, appear most frequently in some part of the adenoid or lymphatic glandular system, and next in the cutaneous surface. Those of the tuberculous, which is colsely allied to, if not a mere modification of the scrofulous, may be met with in any of the more vascular structures of the body, but are most frequent in the lungs, and next in the mucous membranes and lymphatic glands. In leucocythæmia and pseudo-leucocythæmia, the almost uniform tendency is to develop hypertrophy or increased growth of the lymphatic glands and spleen.

Etiology.—There is no doubt but a large proportion of the cases of the several diseases included in this group have their origin primarily in hereditary influence. This I have endeavored to explain already ; but cases are also met with in relation to which no hereditary influence can be traced. These appear to have had their origin from certain causes which had been permitted to act steadily through long periods of time, and yet with so moderate a degree of intensity as to avoid exciting acute general disturbances. One class of these causes produce their deleterious effects by acting primarily on the processes of digestion, assimilation and nutrition ; another class exert their influence on the processes of disintegration and elimination of waste material. To the first, belong insufficient or unwholesome food ; inadequate supply of light, heat, and pure air and want of proper exercise. To the latter, belong all those agents and influences that slowly but persistently retard retrograde metamorphosis in the tissues, or interfere with the elimination of the products of such metamorphosis through the proper excretory organs, such as continued exposure to cold and damp air ; deficient physical exercise ; depressing mental emotions ; the habitual use of alcoholic drinks ; and the occupation of rooms overcrowded, or inadequately supplied with air and sunlight. Food may be insufficient in quantity, or in the variety of its nutritive constituents, or of such quality as to render it indigestible, and in either case, the blood will become more and more defective in the proportion of its nutritive elements, and some of the tissues will be correspondingly impoverished.

There are but few persons in this country who suffer from inability to procure a sufficient amount of food. In the feeding and training of children, however, errors of much importance are frequent among all classes.

Among the poor we often find large families living on the coarser and cheaper articles of food, with but little variety from week to week, and at the same time occupying damp, uncleanly, and ill-ventilated apartments; and glandular swellings, chronic ophthalmias, caries of the bones, and other local evidences of scrofulous and tubercular tendencies are common among them. Quite as often among the rich and fashionable we find the infants and young children committed to the care of nurses, kept much within the limits of the nursery, and indulged so freely in the use of saccharine matter, consisting of sugar, candies, sweet-meats, and sweet-cakes, at any and all times of the day, that they lose all relish for plain bread, milk, meat and other nitrogenous food. The result is that they grow delicate, slender, thin in muscles, with narrow chests, unusual mental vivacity, and extreme susceptibility to all kinds of impressions. The anxious mothers always assert that they are so delicate they will take cold every time they are allowed to go out. It is among the children so trained that we find many of the best samples of the scrofulous constitutional condition, accompanied by frequent temporary, and sometimes permanent, enlargement of the lymphatic glands of the neck. And of those belonging to the same class who live beyond childhood and youth, there are many who become tuberculous between the ages of eighteen and thirty years.

Nothing is more certainly proved by abundant observation, than the fact that long continued living on food deficient in some of the elements needed for healthy growth and repair of living structure, is capable of modifying the assimilative processes in such a way as to develop imperfect cells and other tissue elements. And if to the use of food thus deficient, there be added living and sleeping in inadequately ventilated apartments, too little habitual exercise of the muscles of the chest and upper extremities, and clothing either inadequate for protection against sudden and extreme atmospheric changes or so adjusted as to impede the free expansion of the chest, you have a combination of influences, which, if long continued are certain to so modify the properties of the blood and organized tissues of the body, as to establish some one of the special diatheses or morbid constitutional conditions, whether it be scrofulous, tuberculous, leucocythæmic, or rheumatic. It is also true, that a morbid constitutional condition thus acquired, if well established, is capable of being transmitted from parent to child, and thus start a new line of hereditary influence.

A somewhat careful study of the etiology of constitutional diseases, has led me to the conclusion that the habits of a people in regard to diet, drinks, dress, occupations, and the construction and cleanliness of houses, have far more to do with the production and propagation of the scrofulous, tuberculous, leucocythæmic, cancerous and gouty diatheses, than the elements and influences included under the head of climate; while the latter exert a controlling influence in the formation of the rheumatic predisposition. While the protracted influence of low temperature and dampness, combined with either impure air or insufficient food, tends strongly to produce the scrofulous and tuberculous affections; a climate characterized by low temperature with a high degree of moisture, and accompanied by frequent thermometric changes, without other bad influences by habitually interfering with the natural exhalations from the cutaneous surface, and consequently retaining certain acid constituents in excess in the blood, equally tends to create the rheumatic diathesis. The excretory material thus retained evidently acts as an irritant, increasing the susceptibility of the fibrous tissues, and the plasticity of the blood, and thus placing the individual in the most favorable condition for the development of active rheu-

matic inflammation, with general fever from the temporary action of any exciting cause ; or without any such intervention, by long continuance, inducing those slow hypertrophies and indurations of the fibrous and connective tissues, in different parts of the body, that constitute the purely chronic rheumatic affections so frequently met with in all cold, damp and variable climates.

The most prominent characteristics of the climate in the whole Northern belt of our own country, from the eastern foot of the Rocky Mountains to the Atlantic Coast, are long and very variable transition seasons (spring and autumn), with a predominance of cold and dampness. And it is exactly over this same belt of country that the population furnishes the highest ratio of the prevalence of both rheumatic and catarrhal diseases, as shown many years since in the admirable work on the clim te and diseases of the United States, by Dr. Samuel Forrey, formerly of the medical staff of the United States Army, and confirmed by the statistics of Dr. Daniel Drake, in the first volume of his work on the topography and diseases of the great interior valley of this continent. While it is true that the rheumatic diathesis is generally the result of habitual retention of excretory products capable of increasing the excitability of the organized tissues and the plasticity of the blood, such retention is not always the result of unfavorable atmospheric or external impressions. On the contrary, I have seen numerous instances in which the same pathological conditions were reached, in some cases by protracted muscular exercise by which the products of tissue metamorphosis were developed faster than they could be eliminated through the natural channels ; and in others, by such changes in habits or occupation that a previous habit of active out-door physical exercises sufficient to excite daily increased cutaneous exhalation, was exchanged for one of confinement or purely passive exercise, and consequently less activity in the cutaneous surface.

The gouty constitution or dithesis, like the rheumatic, involves an increase of susceptibility in the fibrous or connective tissues, but with less plasticity of the blood and more tendency to deficiency of the red corpuscles; and the causes most efficient in producing it, are such as directly lessen the action of oxygen in the natural processes of tissue metamorphosis, and the evolvement of those products that are eliminated by the kidneys, instead of the cutaneous structure. The presence of alcohol in the blood lessens the interchange of oxygen and carbonic acid gas through the lungs, and retards the molecular changes in the tissues; consequently its moderate daily use in the form of wine and other fermented drinks, keeps the blood in a state of imperfect decarbonization, diminishing the action of oxygen on the carbonaceous elements of the tissues, and favoring, first, fatty accumulations and subsequently, fatty degenerations. If the individual thus habitually using, moderately, alcoholic drinks, at the same time indulges the appetite for animal food, and takes very little muscular exercise, he will fail to eliminate the elements of urea, uric acid and the salts of sodium through the kidneys sufficiently fast to prevent the blood and tissues from retaining them in excess. It is the habitual presence of this excess of elements naturally excreted by the kidneys, in connection with the imperfect oxygenation and decarbonization of the blood, that induces those changes in the properties of the tissues which constitute the special gouty diathesis; and that every now and then cause the accumulation of such an amount of uric acid and urate of sodium as to excite the characteristic local inflammations of acute and chronic gout. In some instances the pathological conditions just mentioned as constituting the gouty diathesis, have been produced by habitual indulgence in the use of rich

food, and the avoidance of all active physical exercise, without the use of either fermented or distilled liquors. But such cases are very rare; and so far as they have come under my observation there has been reason to suspect some degree of hereditary predisposition derived from the more remote ancestry.

Pathological Inferences.—From what I have now said in regard to the causes capable of favoring the formation of constitutional diseases and their mode of action, you may deduce the following pathological conclusions :

First. That all the affections of this class involve as a primary pathological condition, such a modification of the properties of the organized structures of the body as to render them morbidly susceptible to impressions and to alter the molecular movements concerned in the processes of assimilation, nutrition, and metamorphosis of tissues.

Second. The modification of properties just mentioned may result from hereditary transmission, or from the moderate but long continued action of such causes as are capable of either impairing the processes of assimilation and nutrition; or those of tissue metamorphosis and the execretion of waste products.

Third. In scrofula, tuberculosis, Addison's disease, and pernicious anæmia the special modification of tissue properties is such as to increase the susceptibility by which the patients become morbidly sensitive or unduly influenced by almost every kind of external impression, and such an impairment of vital affinity that the formative processes by which the elements of tissues are evolved in the blood and attracted to their proper places in tissue growth and repair, are rendered imperfect and result in the formation of aplastic or cacoplastic material, as found in the caseous and tuberculous deposits and degenerations ; or so greatly impaired as to arrest the formative processes altogether, as in the pernicious anæmia.

Fourth. In leucocythæmia and carcinoma there is less alteration of the susceptibility or excitability, but such an alteration of the vital affinity, or force, controlling the formative processes, as to result in an increase of the leucocytes and lymphoid cells, leading in the one disease to their marked excess in the blood, with hypertrophy of the adenoid glandular structures in different parts of the body, and in the other, to a more specific and localized cell and fibrous development, constituting the varieties of cancerous tumors capable of development chiefly in the dermoid and glandular structures containing epithelium.

Fifth. In rheumatism or gout, the general diathesis or modification of tissue properties is such as to increase in a marked degree the susceptibility or general irritability of the organized structures, and to so modify the molecular movements in the metamorphic and excretory processes as to cause the retention and consequent accumulation in the blood, of an excess of certain excretory products, which, by their action on the already morbidly susceptible tissues, are capable of exciting the specific local inflammations of rheumatism and gout. In the present status of pathological investigations, I may state it as probable that the retained excretory or morbid products in rheumatism are chiefly lactic acid, and the lactic acid salts ; and in gout, the uric acid and urates.

Principles of Treatment.—From the statements I have made concerning the causes and general pathology of the whole class of constitutional diseases, you will readily perceive that their practical management involves two distinct objects, namely : the removal of the general constitutional vice or predisposition, and the treatment of the various local affections that may appear from time to time during the progress of each individual case.

The accomplishment of the first object will depend, mainly, on our ability to remove the patient from the further action of those causes and influences that favor the development of the particular diathesis in question, and to substitute in their place such hygienic and sanitary measures as will bring a strong influence in the opposite direction. As all these diatheses, when not hereditary, are the result of influences acting moderately through long periods of time, so they can be removed only by influences acting with equal persistence in such direction as to induce an opposite effect. In all these affections, so far as the constitutional condition is concerned, a resort to active temporary medication of any kind, is both unphilosophical and useless. And yet, there are some medicines capable of affording material aid to the patient, if properly selected, given in moderate doses and continued for a long time. One of the chief difficulties in treating successfully all constitutional diseases and defects, is the inability of the patient and his friends to appreciate the necessity for persistence in the use of whatever remedial agents or influences are deemed necessary. It seems difficult for them, and sometimes even for the physician, to realize the fact that morbid conditions and processes which have been years in developing, or may have been inherited, can not be removed or permanently corrected by the use of this or that remedy for a few days, or by a vacation from school or business, and a change of air, exercise, or climate, for a few weeks, or at most, a few months.

Consequently we see but few well devised and persistently executed plans of treatment adopted for either preventing or curing the constitutional conditions now under consideration. As a general rule, you see the children of scrofulous, tuberculous, cancerous, syphilitic, and gouty parents, receiving no more attention in regard to their physical training than those of healthy parents. Yet, it is during the period of childhood and youth, while the structures of the body are undergoing active development, that we have the best, if not the only, opportunity to correct such morbid tendencies as result from hereditary influence. And every physician should regard it as one of his most important professional duties to note the special morbid tendencies of all the families who rely upon him for medical services, and be as careful to point out the means for correcting them, as he is to prescribe medicines when they are actively sick. The family physician should realize that he is the guardian of the health of the families by whom he is employed; and he should so far interest himself in the welfare of the children, especially, that in his professional intercourse he should make such suggestions from time to time regarding the physical exercise, diet, dress, and education of the children as may be necessary to correct hereditary defects or acquired morbid tendencies during the years when such corrections are possible. I can not too strongly impress upon each one of you the importance of this subject.

As the leading pathological or morbid elements of the scrofulous and tuberculous diatheses are undue excitability, coincident with impairment of vital affinity or formative force, and possibly deficiency of the phosphatic and calcium compounds in the blood, so the remedial measures adopted should be such as are most efficient in lessening the former and in increasing the two latter. Among the most important of these measures is a plentiful supply of dry pure air, at a genial temperature for out-door exercise or exposure; a sufficient quantity and variety of nutritious and easily digestible food; clothing of such quality and so adjusted as will best protect the cutaneous surface from sudden and severe atmospheric changes, and leave all the important movements and functions of the body free from mechanical interference; and such

habitual daily muscular or physical exercises as tend to increase the development and strength of the muscular structures generally, and especially those of the chest and upper extremities.

The heads of all families should be fully advised by their physician of the necessity of free ventilation in every part of their dwellings, and especially in their sleeping-rooms. Neither children nor adults should be allowed to sleep in cellar or basement rooms, or rooms anywhere that do not admit of free ventilation and sunlight, and afford, when closed, at least 800 cubic feet of air space for each person occupying them. The physiological law, that regular habitual exercise within certain limits, increases the amount and improves the quality of nutrition, is one of primary importance, as affording a means for correcting the defects and inequalities of development, whether hereditary or acquired, which exist in a large proportion of all the varieties of constitutional disease. By good air, a fair variety of good food, and regular daily exercise, weak and slender muscles can be made compact and strong ; narrow chests with deficient air space can be made broader and more capacious ; and with a more complete oxygenation and decarbonization of the blood, will come healthier secretory actions and more perfect digestion, assimilation and nutrition. Thus, a bad constitution, or decided predisposition to disease, can be changed into one healthy, and even strong. But it requires much time, judicious direction, and undeviating steadiness of purpose in the daily execution of the work or play directed. And when the morbid conditions or defects have become well developed, and the period of growth nearly or quite completed, before the systematic work of correction has been commenced, it may become necessary to add to the hygienic and sanitary measures already alluded to, a change of climate, either temporary or permanent. As a general rule, you will find it most beneficial to send those who have been habitually living in interior valleys, of moist and alluvial formation, either to dry, mild, and elevated mountain ranges, or to the sea shore or on sea voyages.

Those whose chief defects consist in slender muscles, narrow chests, and undue sensitiveness of the respiratory organs, will do best in the mild, dry, and pure air of the mountains ; while those whose defects are chiefly in the functions of the digestive and assimilative organs, will do best in the more stimulating and alterant atmosphere of the ocean. And yet those who have either inherited or acquired defects while permanently residing near the sea, will often be equally benefited by a change either to the interior valleys or mountains.

If, in the management of the scrofulous, tuberculous, and kindred diatheses, medicinal agents are resorted to, they should be of such a nature as to be capable of diminishing the general excitability and of promoting the efficiency of the assimilative processes. In other words they should be soothing, tonic, and corrective, or mildly alterant. In former times small doses of the aqueous solution of iodine, given in some mildly sedative vegetable infusion soon after each meal-time, were much used and with good effect. The vegetable infusions most used were those of the sarsaparilla, prunus virginiana, cimicifuga racemosa, and pipsissewa. During the last fifteen or twenty years I have had frequent occasion to recommend for the same purposes a combination of two parts of the syrup of iodide of calcium with one part of the fluid extract of humulus lupulus, or hop. To patients over fifteen years of age, four cubic centimeters (fl. ʒi) of this mixture may be given just after each regular meal-time. To younger children the dose should be proportionately less. If the patient becomes weary of taking this, I substitute the syrup of lacto-phosphate of calcium for two or three weeks, after which the other can be resumed.

But in counteracting the constitutional predispositions now under consideration, no medicines, however long their use may be continued, can be relied upon to the exclusion or neglect of the hygienic and climatic influences to which I have referred.

The diathesis or constitutional condition favoring the development of the various forms of cancerous or malignant growths is one of the most obscure in the list of chronic general diseases. I am aware that many of the pathologists and practical surgeons of the present day regard all this class of morbid structural developments as primarily local, and claim that the general cachexia or diathesis is secondary, and the result of the diffusion of the cancer cells or germs originating in the local affection. But the fact that the predisposition to the disease is capable of hereditary transmission, while the local development of cancerous structure is often postponed until after the middle period of life, shows that there must be some deviation from the strictly healthy condition of the properties that govern the combinations of organic matter in the development of tissue elements, prior to the first germ of local morbid structure. Again, the fact that in a very large majority of cases, cancerous growths re-appear after the earliest and most complete removal of the first unhealthy structure, points to the same conclusion. I have assumed, therefore, that there is a cancerous diathesis, or constitutional predisposition which, if not removed, will in due time lead to the development of some variety of cancerous structure. In a large proportion of cases this diathesis is the result of hereditary influence ; but that it may be acquired without such influence is also proved by the history of many cases in which no prior existence of this form of disease can be traced in either line of ancestry.

By what circumstances connected with diet, drinks, modes of living, or climate, the formation of such a diathesis is favored or counteracted, very little is known. In 1866 my colleague in the department of surgery, Dr. E. Andrews, by a careful and accurate examination of the mortality statistics of this country as returned by the United States census for 1860, found a much higher ratio of deaths from cancerous diseases in the six New England States, and next in New York, Pennsylvania, New Jersey and Delaware ; the ratio steadily diminishing as he progressed south through the Atlantic States to the peninsula of Florida. The ratio was higher in the States occupying the northern part of the interior valley of the continent than in those farther south, the lowest ratio of all being in the extreme southwest, embracing the States of Texas, Missouri, Louisiana, Arkansas, and New Mexico. The last named State returned only one death from cancer to two hundred and seventy from all diseases, while Vermont returned one from cancer to forty from all diseases. These figures would appear to show that the prevalence of cancerous affections was favored by a cold, variable, and damp climate, such as that which characterizes the northeastern and northern belt of the United States, and to be opposed by one that is mild and dry.

A more thorough examination of this part of the subject will probably demonstrate the proposition that cancerous affections prevail most wherever a cold and variable climate co-exists with density of population, thereby following very nearly the same law of prevalence as scrofula and tuberculosis.* Many facts have come under my own observation favoring the idea that a liberal use of meat coupled with in-door occupations or sedentary habits, had a tendency to increase the cancerous predisposition,

* See Relations of Cancer and Consumption to Climate in the United States. By E. Andrews M. D. Chicago Medical Examiner, Vol. VII. p. 737. 1866.

as it certainly does the local cancerous growths after they have commenced. In the present state of medical knowledge, perhaps the best advice you can give to parties, who, from known hereditary predisposition or otherwise, are desirous of counteracting the development of cancerous disease in any of the structures of the body, is, that they shall live in a mild, dry climate, remote from and elevated above the sea; to take free exercise in the open air; to use meat only sparingly; and wholly avoid all use of alcoholic drinks and tobacco. The principles that should govern us in the management of the rheumatic and gouty diatheses are plainly inferable from what I have already said regarding their mode of development: and the details of their application will be further explained, when I come to speak of the active local developments of these affections. Having completed what I deem important to say regarding the general management of constitutional diseases, I shall reserve the consideration of the treatment necessary after local affections have become apparent, until I call your attention to each of the several diseases included in this group separately.

LECTURE XXVIII.

Scrofula—Varieties of Local Development; Symptoms, Progress and Results; Special Pathological Changes, and Treatment.

GENTLEMEN: I invite your attention during the present hour, to those local developments of disease which are connected with, and more or less dependent on, the general scrofulous diathesis as described in the preceding lecture.

The local affections, to which I allude, are inflammatory in their character, and are most frequently developed in the lymphatic glands, the mucous membranes, more especially of the eyes, nose and intestines, the skin, and the periosteum.

Adenitis.—In the ordinary field of general practice, you will meet with inflammation and enlargement of the lymphatic glands very frequently, especially in children and youth. In a large majority of cases, the glandular affection is seen only in the neck; in other cases in the axillæ and groin; and more rarely in other parts of the body. As the scrofulous constitution differs much in the degree of its development in different cases, so the affections of the lymphatic glands accompanying such constitutional conditions, vary much in the activity of their development, progress and results. For convenience of description, I may include them all in three groups. The first group includes all cases of chronic enlargement or hypertrophy of the glands from sclerosis of the connective tissue, and increase of the lymphoid cells without caseous degeneration. The second, such cases as are equally chronic or slow in development, but in which the exudation in the central part of the glands undergo caseous degeneration and ultimate purulent softening. The third includes cases of a more acute character, in which the glands become more rapidly enlarged with exudative material that quickly degenerates, forming some caseous matter, mixed directly with pus, causing the substance of the gland to be early converted into an abscess, which, when discharged,

usually manifests a strong tendency to extend the opening into an ulcer, with excavated edges, and but little tendency to fill up with healthy granulations.

The cases belonging to the first group are met with, most frequently, in children between the ages of five and fifteen years, who are delicate and usually spare in flesh, but in whom the scrofulous diathesis is only moderately developed. In some instances, the first swelling of the glands is traceable to exposure to cold, or to an attack of measles, scarlatina, or diphtheria, but in a much larger number of cases the glandular affection commences without known cause, and without sufficient pain or soreness to attract the attention of the patient. They generally appear in the form of smooth, firm, round tumors, varying in size from that of a pea to a hickory-nut; very movable under the skin, and without tenderness to the touch. They are apt to appear first along the margin of the upper third of the sterno-cleido-mastoid muscle, but may be found along any part of the side of the neck, from the mastoid process to the outer third of the clavicle, or in the groin.

You may find only one or two in some cases, and in others a dozen or more, forming a chain along the whole course of the muscle just named. They are distinguished from all forms of malignant growth, by their moderate firmness or density, smoothness of surface, rounded form, and free mobility under the skin.

A large proportion of these glandular enlargements, after attaining, by slow growth, a size varying from that of a large pea to that of a hickory-nut, remain nearly stationary for many months, and sometimes years, and finally disappear by resolution.

On the other hand, they are liable at any time, by sudden exposure to cold currents of air, or other irritating influences, to become more actively inflamed, tender to the touch, and more swollen, when in many instances suppuration ensues, the interior of the gland becomes a simple accumulation of pus, the free discharge of which is soon followed by cicatrization, and a more or less permanent scar.

Cases of the second group are more frequently developed in persons between twelve and twenty years of age. Their beginning is very generally traceable to some direct exposure to cold, damp currents of air, to the effects of some one of the eruptive fevers, or to an attack of diphtheria. There may be only one or many glands involved at the same time; more frequently there are two or more forming a cluster of swollen glands below the parotid region, and often extending forward below the angle of the jaw and backward to the mastoid region. They are generally smooth, rounded, and more or less tender to the touch, especially in the early stage. After one or two weeks, in many cases, the tenderness to the touch disappears, the glands cease to enlarge, and some of the smaller ones begin slowly to disappear by resolution. The larger ones appear to remain stationary for several weeks, or even months, exhibiting a little tenderness, and perhaps increased swelling for a few days at a time, when the patient is unduly exposed or suffering from any general febrile disturbance. Sooner or later, however, you can begin to feel in one or more of the more prominent glands, a sense of softening or semi-fluctuation.

This softening is, in some instances, felt only on the most prominent part of the gland, and as though the fluid was not far from the surface, while the deeper parts of the gland remain hard, giving it the appearance of a small abscess resting on a broad, hard base. A week or two later the sense of fluctuation will have become plainer, the skin and subcutaneous tissues more adherent to the enlarged gland, but the base is still hard.

If allowed to go on without interference, the matter in the gland will continue very slowly to approach the surface; the skin becomes slightly red or purplish color over the most prominent part of the swelling, and eventually from one to four small openings will form, through which the thinner part of the matter will discharge.

Sometimes these openings will gradually enlarge until several unite in one large opening with thin, excavated edges, and exposing the bottom or base of the gland, generally covered with a layer of white material, with no appearance of healthy granulations. In most cases there are little masses of caseous material that escape with the thinner pus before the abscess becomes converted into an open sore. If proper measures are taken to improve the general health, the hard base of these sores gradually disappears, the discharge improves in quality and lessens in quantity; granulations spring up which are very prone to become large and spongy, but cicatrization is eventually completed, and almost always leaves a permanently irregular, depressed and unseemly scar.

The third group of cases to which I have alluded, differ from the second chiefly in their more acute character and greater tendency to involve, in the suppurative stage, the adjacent areolar or connective tissue and the skin. The glands primarily attacked enlarge rapidly, are less movable, quite tender to the touch, and present early a blush of redness on the surface. If several glands are attacked at the same time, as frequently happens, especially in the neck and groin, the pulse will be accelerated and the temperature elevated from two to three degrees above the natural standard, constituting a moderate general febrile condition. This usually continues one or two weeks, or until the suppurative stage is completed and the resulting abscesses discharged, either spontaneously or by free incision. As this group of cases often involves much of the connective tissue surrounding the glands, when several are affected near each other, the skin becomes extensively undermined by the extent of the suppuration, and each opening enlarges into a spreading ulcer with copious purulent discharge. It is only a few weeks since I saw a young woman with four of these large open ulcers on the upper part of the side of the neck, varying in size from twelve to thirty millimeters in diameter, leaving, in some places, only narrow strips of skin between them. I have seen other cases presenting similar sores along the upper side of the clavicle from its junction with the sternum to the acromion process of the scapula, and smaller isolated sores in other parts of the body and on the extremities. In all these cases the patients were spare in flesh, pale, easily fatigued, with variable appetite and imperfect digestion. A small proportion of them presented also slight cough and the physical signs of crude, tubercular deposits in the upper part of one or both lungs. But I have not found pulmonary tuberculosis a frequent accompaniment of scrofulous disease of the lymphatic glandular system. All the forms of disease I have described as affecting the lymphatic glands externally, are met with, but less frequently, in the same class of glands in the internal cavities, and in the glands of the mesentery, constituting what the older writers termed "tabes mesenterica." I have seen some cases in children in which the abdomen became much distended from the enlargement and caseous degeneration of the glands of the mesentery. In one of these cases, a boy nearly three years of age, two of the enlarged masses became adherent to the anterior walls of the abdomen, ulcerated through and discharged a large amount of thin pus mixed with many lumps of caseous matter; but the patient finally died from extreme emaciation and exhaustion. More recently I saw in consultation a young woman, sixteen years of age, whose abdomen had

become filled up with these large glandular tumors, one of the largest of which had gradually softened and finally discharged its contents, composed of sero-purulent fluid and curds of caseous matter, into the intestines. Only partial or temporary relief followed these discharges, and the patient after lingering many months, died.

Pathological Anatomy.—The pathological changes which take place in the adenoid or glandular structures when affected by scrofulous disease, are first simple increase of both connective tissue and lymphoid cells, causing increased growth or hypertrophy of the glands.

This is the condition represented by the first group of cases. In the second and third groups the same changes occur, but in addition there are also formed large cells with many nuclei, called giant cells, and exudations of granular matter, all of which undergo caseous degeneration, and ultimately partial or complete conversion into pus. In many of the specimens are found accumulations identical in appearance with the structure of tubercle, affording another evidence that there is a very close relationship, if not identity, between scrofula and tuberculosis.

Treatment.—In the management of all the forms and stages of glandular scrofula, the most careful and persevering attention must be given to the improvement of the general constitutional condition or diathesis of the patient. Without this, all remedies addressed directly to the local glandular enlargements will have but little effect. Therefore all that I said in the preceding lecture in regard to the hygienic and sanitary measures necessary for mitigating or removing the scrofulous and tuberculous diatheses, you must give full heed to, in the treatment of the particular forms of disease now under consideration. In addition, however, to the faithful attention necessary for securing to the patient, good air, good food, suitable clothing, sunlight, and well-regulated exercise, as described in the preceding lecture, the long-continued internal use of small doses of iodine is a measure of much importance. The best form for its administration is the aqueous solution, of which the following is a convenient formula:

℞	Iodini,	0.50 grams.	gr. viii
	Potassii Iodidi	2.00 "	gr. xxx
	Aquæ Distillatæ	45.00 c. c.	℥iss

Mix. To patients fifteen years of age and over, 0.60 c. c. (min. x) may be given at each meal time, in from one to two tablespoonfuls of sweetened water. To younger patients the dose should be proportionately less, but it should always be given largely diluted with water. To obtain its full curative influence its use must be continued, with only occasional interruptions of three or four days at a time, from one to six months. If the foregoing treatment is commenced while the glands are simply enlarged from an increase of the connective tissue and lymphoid cells without caseous degeneration, and is continued with the proper hygienic regulations, in a large majority of the cases the enlargements will slowly disappear and the health will be restored.

But if the central part of the diseased glands has already undergone caseous degeneration, and especially if there is an intermixture of tuberculous matter, as in many of the cases that I have described as belonging to the second and third groups, it is rare that resolution can be effected by any treatment. Even in such cases, however, the treatment judiciously adjusted will aid in promoting the general health, lessening the extent of the suppuration, and rendering the reparative processes more efficient.

Whenever scrofulous glands do suppurate, it is better to discharge the matter by an early incision, than to wait for a spontaneous opening; inasmuch as the former is usually followed by a smaller and more regular cicatrix than the latter. In some cases attended by extensive suppuration and a disposition to the formation of open ulcers with irregular and excavated edges, I have seen the most satisfactory improvement result from the internal use of small doses of the bichloride of mercury dissolved in the compound tincture of cinchona, as in the following formula:

℞			
Hydrargyri Chloridi Corrosivi	0.06	grams	gr. i
Tincturæ Cinchonæ Compositæ	90.00	c. c.	℥iii
Extracti Conii Fluidi	15.00	c. c.	℥iv
Syrupus Simplicis	15.00	c. c.	℥iv

Mix. Shake the vial and give four cubic centimeters (fl. ℥i) to an adult, mixed with a tablespoonful of water, and repeat it before breakfast, dinner and supper. I have repeatedly seen thoroughly scrofulous patients gain in flesh, strength, appetite, and their sores heal, while using this combination, who had previously taken cod-liver oil, malt, hypophosphites, and preparations of iron for several months without improvement.

It rarely produces any perceptible soreness of the gums or mouth, even when its use is continued uninterruptedly for six or eight weeks. Like the iodine, the bichloride of mercury is a general alterant, capable of so modifying the properties and molecular movements as to counteract the tendency to fatty and caseous degenerations, and to increase assimilation and healthy hæmatosis. It is a common practice to apply iodine externally to the swollen glands, either in the form of tincture painted over the surface of the swelling, or mixed with camphorated soap liniment, two or three parts to one of the tincture of iodine, and applied more freely morning and evening. I have seldom seen any marked benefit from these or any other external applications in the treatment of scrofulous swellings.

Applications of the undiluted tincture of iodine soon destroy the cuticle, and so inflame the skin as to render the subsequent applications very painful. For this reason I have generally preferred its dilution with camphorated soap liniment sufficient to allow of free wetting of the surface, morning and evening, without pain. When the texture of a gland has began to soften from the formation of pus, if any external applications are made, they should be of an emolient character.

Scrofulous Inflammation of Mucous Membrane, etc.—Children and youth of decided scrofulous tendency, are very liable to attacks of inflammation in the schneiderian membrane, conjunctiva, the tarsus of the eyelids, the cornea, and sometimes the lining of the meatus of the ear. In the latter, it sometimes presents the form of impetiginous pustules which soon mature, discharge a drop or two of matter, and disappear; or the eruption may assume a chronic form, extending by the addition of new pustules out upon the tragus and lobe of the ear; the matter in the pustules drying into light brown scabs, and giving to the meatus and parts surrounding, a sore and untidy appearance, and not unfrequently an offensive odor. In other cases, instead of an eruption, the inflammation invades the sub-cutaneous tissue, causing swelling and much pain in the meatus and ending in the formation of one or more small abscesses. The pain usually ceases with the opening or breaking of the abcess, but in many instances more or less purulent discharge continues several weeks. In other cases the discharge ceases in three or four days, only to be followed, in one or two weeks, by a renewal of the pain and another abscess, until the little

patients become pale, fretful, restless at night, and very sensitive to atmospheric and all other external impressions.

The same class of children are much subject to chronic inflammation of the membrane lining the nostrils, causing a purulent and often offensive discharge, constituting a form of ozena. In some of these cases eruptions appear on the margins of the anterior nares and the middle section of the upper lip, similar to those already described as occurring in the meatus and adjacent parts of the ear, giving to the upper lip and wings of the nose a sore and swollen appearance. Still more frequently, perhaps, you will find the same grades of inflammation attacking the tarsus of the eyelids, involving both the conjunctival lining of the lids and the follicles and glandular structures imbedded in the edge of the tarsus. The inflammation may be so slight as to cause only a little thickening of the edge of the tarsus, with the escape of a small amount of a gluey exudation, that dries into hard masses at the root of the eyelashes, and sometimes causes the edges of the lids to be stuck together on awakening in the morning, with slight morbid sensitiveness to light, and the occasional formation of a pustule or sty in the edge of the tarsus. If left to its own tendencies, this condition of the eyelids may continue, with but little variation, for many months, or even years. In some of the more severe cases, all the structures entering into the tarsus of the lids become hypertrophied, giving to the edges of the eyelids a thickened and indurated condition, with irregular growth of the eyelashes, and sufficient inversion or entropion, to bring some of the smaller and less perfect eyelashes in contact with the surface of the cornea, with all the symptoms of a foreign body in the eye, and the establishment of slow corneitic inflammation and diminished transparency.

In another series of cases, the inflammation attacks primarily the ciliary processes and cornea, causing constant photophobia, profuse flow of tears, a red zone around some part of the margin of the cornea, composed of distended blood-vessels running strictly parallel with each other, and at first terminating abruptly at the margin of the cornea, but subsequently traceable into or upon the cornea, as if slowly progressing toward a common center.

In most of the cases, at the same time that the red vessels are seen entering the cornea, one or more small and superficial ulcers may be seen on the surface of the latter, looking like simple indentations. If not interfered with by proper treatment, the ulcers slowly extend both in circumference and depth, until they perforate all the layers of cornea, and allow the delicate membrane lining the anterior chamber of the eye to protrude like a hernia through the opening; and, in some instances, this membrane is also perforated, allowing the aqueous humor to escape, with partial collapse of the eyeball, adhesions of the iris, and permanent loss of vision. In other cases, the ulcers penetrate only through the external layer of the cornea, while effusion adds to the aqueous humor, causing the weakened cornea to yield to the internal pressure by protruding forward and assuming a conical shape, with diminished transparency. In a large majority of the cases, however, the ulcers neither penetrate through the cornea, nor lead to alterations of its shape, but remain superficial, sometimes almost disappearing spontaneously with corresponding improvement in all the other symptoms, and then increasing again without any appreciable cause; thus causing the patients to suffer from more or less photophobia and inability to use the eyes, either for the purposes of work or education, through an indefinite period of time. In former years I have seen and treated many of these cases of irritable scrofulous ophthalmia,

in all their grades and stages; and, among them, it has been not uncommon to find here and there a child, presenting at one and the same time, the affections I have described, equally developed in the ears, nose and eyes. When scrofulous inflammation attacks the cutaneous tissue, it may appear in the form of bullæ or vesicles of pemphigus, which after breaking and discharging the serum or drying up and forming thin scabs, fail to cicatrize, and soon present large, superficial and irritable ulcers, with little or no disposition to heal. Or, what is more common, is the appearance of one or more inflamed places, varying in size from six to eighteen millimeters (one to three-quarters of an inch) in diameter, dark or purplish red in color, not acutely painful, but tender to the touch, harder than natural, and extending into the subcutaneous tissue, as though there might be a tendency to the formation of a small abscess. The hard lump or swelling thus formed, usually changes very slowly.

It neither undergoes resolution nor progresses to the formation of an abscess, but remains nearly stationary for several weeks, during which the skin over the central part of the swelling becomes corrugated, partially covered with laminæ of cuticle, and finally develops a brown scab, which on falling off leaves an open sore. In some cases the ulcer is superficial, presenting just enough purulent secretion to favor the formation of a scab; in others, its surface is irregular or nodulated, and covered with a layer of white lymph, and destitute of granulations. As it progresses, the nodules are found to consist largely of caseous material, which disintegrates slowly and sometimes separates in masses, causing the ulcer to become deeper and larger until the diseased tissue has all disappeared. The inflammations I have described, more frequently attack the arms and legs and lower part of the neck in the vicinity of the clavicle, or over the upper part of the scapula, but may occur on any part of the cutaneous surface. I have met with them chiefly among the children of the poor, living in the midst of bad sanitary conditions, more especially in damp, uncleanly and imperfectly ventilated houses. The only affections with which they are liable to be confounded, are those resulting from constitutional syphilis. If careful attention is given to the individual and family history of each case, together with the fact that nearly all chronic sores and ulcers resulting from constitutional syphilis, present edges of a coppery, instead of brownish or livid hue, the diagnosis can be established with reasonable certainty. There is but one remaining form of local trouble connected with the scrofulous diathesis to which I will direct your attention at this time. It is that which affects the periosteum and sometimes leads to caries or necrosis of the bones. It is probable that many of the cases of coxalgia or hip-joint disease, and of caries and angular curvature of the spine, are given their special direction and development by the prior existence of a true scrofulous constitutional condition of the patient.

These, however, are so fully within the domain of surgery, that I shall make no further allusion to them here. The cases of scrofulous periostitis that will come more directly under the care of the physician, and in which an early, correct diagnosis is very important, may be included in two groups. The first group embraces such cases as commence in the articulations, and in which the local inflammation involves coincidently, the periostum covering the ends of the bones, the cartilages, and often the ligaments with which they are connected. The cases of this kind are most frequently seen in the ankle and arch of the foot, the knees, the wrists, and the elbows. It generally commences with moderate diffused swelling of the part, accompanied by some pain, which is increased by motion and pressure, slight increase of heat, but with little or no change of color

upon the surface. The swelling, pain and tenderness slowly but persistently increase, and after several weeks or months, suppuration is established, and whether incisions are made or the matter is allowed to find its exit spontaneously, the openings once formed remain fistulous; or, if they temporarily close, the pressure of the purulent accumulations cause them to re-open, or new ones to form in their place. A careful probing of these openings, now, will show that the structures intervening between the bony surfaces have been largely destroyed, either by softening and interstitial absorption or by suppuration, and that more or less of the bony surfaces are denuded of their periosteum and rough. In the meantime, the patients have become much reduced in flesh and strength, and not unfrequently present all the phenomena of hectic fever, with latent tubercular deposits in the lungs or follicles of the intestines, or in both. It is of much practical importance to make a correct diagnosis in the first stage of all these cases, because the appropriate treatment may arrest their progress and prevent those changes which, if allowed to continue, may occasion the loss of a limb or the sacrifice of a life. In the early stage many of these cases are mistaken for sub-acute rheumatism until suppuration or other destructive changes become so far developed as to correct the error. If you will give due attention to the fact that the scrofulous inflammation usually commences without any reference to sudden atmospheric changes, progresses slowly, and persistently holds its position in the locality where it commences, while sub-acute rheumatism is always markedly influenced by atmospheric conditions, is migratory or moving from one articulation to another, and very rarely fails to attack several localities, either simultaneously or in regular succession, you will seldom mistake one of these affections for the other. In the second group of cases of scrofulous periostitis the disease commences on some part of the body or shaft of the bone, and is most frequently seen on the phalanges of the fingers, the ulna, the clavicle, the sternum, and the long bones of the lower extremities. It is manifested, first, by a diffused swelling or thickening of the periosteum, usually with only a dull pain and moderate tenderness to pressure, but neither redness nor heat. If not interfered with by treatment, the swelling slowly increases and extends more around the circumference of the bone, the surface shows a more dull red or purplish color and more tender to the touch. After several weeks of very slow progress, some one or two places become more prominent and present a semi-fluctuating feeling; the skin at these points is deeper or more livid red and more sensitive to pressure. If a free incision is made, it generally gives exit to a small amount of pus, and is not followed by any considerable diminution of the swelling, but remains open and often enlarges into a deep, ill-conditioned ulcer, sometimes from sloughing, and other times from simple disintegration of the tissues. If an incision is not made, one or more small openings eventually form, giving exit to a small quantity of thin pus or sero-purulent fluid, after which they extend in the same manner as in case of an incision.

In some cases, several of these openings form over the surface of the same bone. Sometimes the periosteum is destroyed, and the naked, rough surface of the bone may be seen or touched with a probe at the bottom of the sores. In one girl, about seven years of age, there were three deep, indolent sores on the side of the neck, in place of destroyed lymphatic glands, two over the surface of the clavicle, and one over the upper segment of the sternum. Several years since, a boy about five years of age came under my observation, who had nearly all the phalanges of his fingers attacked at different times with scrofulous periostitis. In three fingers of one hand, and two of the other, the periosteal inflammation gradually ex-

tended over the whole length of the middle phalange, separating and destroying it to such a degree as to cause necrosis of the whole bone, necessitating its removal, and leaving each finger much shortened and its usefulness impaired. Yet he subsequently recovered fair health. In many of this class of cases you may find some difficulty in maintaining a definite line of distinction between them and the periosteal inflammations dependent on constitutional syphilis. The latter usually occur in adult life, are much the more frequently connected with the tibia, bones of the cranium, nose and ulna, and suppurate slowly, leading to caries of the bones and fistulous openings, but seldom to large open sores. The scrofulous affection is manifested chiefly in children under fifteen years of age—more frequently attacks the fingers, clavicle, sternum, and parts entering into the articulations, suppurates more readily, and in doing so, involves to a greater extent all the soft tissues lying over the seat of disease. These facts, with strict attention to the history of the patient and his hereditary predisposition, will enable you to make a correct diagnosis in all ordinary cases. It has been claimed by some members of the profession, of great eminence, however, that all the forms of scrofula are only the more remote manifestations of constitutional and hereditary syphilis.*

Treatment.—The same principles of treatment, both hygienic and medical, are applicable in the management of the scrofulous affections of mucous membranes, skin, periosteum, etc., as I have already explained to you in speaking of the treatment of glandular scrofula. The same careful attention to good air, appropriate food, and such exercise as the patient will bear, is essential to the success of any plan of treatment that may be devised; and in most cases, a limited and judicious use of iodine or the bichloride of mercury, or both alternately, as general alterants, will be found necessary. In almost all cases they should be given coincidently with the preparations of peruvian bark or other bitter tonics. In the scrofulous ophthalmia of children, characterized by irritable ulcerations of the cornea and great photophobia, I have found no other treatment so certain to arrest the progress of the disease and ultimately restore the patient to health, as the use of the formula I have given you containing the bichloride of mercury, compound tincture of cinchona, etc., in doses suited to the age of the patient, with only very mild anodyne applications externally, or none at all. In all of this class of cases the eyes should be shaded from the direct rays of light, but should not be closely covered nor the patient confined to a dark room. In nearly all the cases of indolent, non-granulating scrofulous ulcers in the skin, and in the periosteal affections I have described, I have succeeded best by giving the formula containing the bichloride of mercury for the first two weeks of the treatment and then substituting the iodine. You may be ready to ask why I do not use the combinations of mercury and iodine, in the forms of proto or bin-iodides, in these cases. My answer is, that simple clinical experience has shown me that I do not get the same good effects from them, while they are much more liable to disturb the stomach or bowels. Neither have I ever obtained any perceptible good effects from the internal administration of the iodides of potassium, sodium and ammonium, in true scrofulous affections. On the contrary, if given in the usual liberal doses, they soon begin to impair the appetite, lessen the activity of nutrition, and create increased feelings of weakness, with no improvement in the local affections. This constitutes a marked distinction between the effects of remedies in the treatment of true scrofula and constitutional syphilis.

*See Address on Surgery, by S. D. Gross, M. D., LLD., etc. Transactions of the American Medical Association, Vol. 25, p. 249 to 292.—1874.

Local Applications.—In all the forms of scrofulous ulcers, except those in the cornea or other parts of the eye-ball, slightly stimulating and antiseptic applications once or twice a day will generally do some good. Weak solutions of iodine, permanganate of potassium, carbolic acid, and benzoic, acid, are among the best. They may be applied morning and evening and the sores covered in the interval with lint smeared with cosmoline or vaseline. In those cases of purely chronic inflammation and thickening of the tarsus of the eyelids, with the exudation of a gummy substance, causing the lids to adhere to each other in the morning, I have obtained much benefit from the application of the following salve:

℞	Hydrargyri Oxidi Rubri Powder finely and add	1 gram	gr. xv.
	Cerati Simplicis	30 grams	℥i.

Mix thoroughly, and apply a little to the edges of the eyelids just before going to bed each night.

Care must be exercised to have the salve accurately applied simply to the margin, and not to the inner surface of the lids. Very much more might be said in regard to the use of remedies in the treatment of the various local affections connected with the scrofulous diathesis; but I have given you the results of a long and ample experience, during which I have tried almost every variety of treatment hitherto proposed in this troublesome class of affections, and I am satisfied that the suggestions I have made, if judiciously applied, will give you the best results attainable in the present state of medical science.

LECTURE XXIX.

Leucocythæmia, Pseudo-Leucocythæmia, Pernicious Anæmia and Addison's Disease—Their History, Causes, Symptoms, Special Pathology, Diagnosis, Prognosis and Treatment.

GENTLEMEN:—If I were to follow strictly the order given in my enumeration of the diseases included in the class now under consideration, I should next consider the local developments of tuberculosis. But such of these developments as are not intimately connected with the local scrofulous affections considered during the preceding lecture hour, are so uniformly connected with the lungs, constituting a form of pulmonary phthisis, or with the membranes of the brain leading to a form of meningitis, that I shall consider them in connection with the other local affections of the respiratory organs and membranes of the brain. I do this chiefly because a proper study of their diagnosis involves a close comparison between them and the different grades of inflammation in the same structures. Passing by the local manifestations of tuberculosis for the present, I shall now consider briefly the diseases recently named Leucocythæmia, pseudo-leucocythæmia, etc. These names have been used to designate forms of disease very closely related to each other, and to the adenoid or glandular form of scrofula. Indeed, until a comparatively

recent period, the cases included under these heads were generally regarded as only different forms of scrofula. In 1845, Dr. Hughes Bennett first called attention to the fact that a certain group of cases were uniformly characterized by a large excess of white corpuscles in the blood, coupled with hypertrophy or hyperplasia of the spleen, and a large number of the lymphatic glands in different parts of the body; and he gave to them the name of leucocythæmia. About the same time Virchow described a similar group of cases and called the disease leukæmia, or leucæmia, meaning white blood. Both identified and described the same form of disease, but the name chosen by Bennett, meaning excess of white corpuscles instead of white blood, is the most appropriate. Although never differentiated from other forms of anæmia and scrofula until done by Bennett and Virchow in 1845, yet the disease now called leucocythæmia has occurred in all civilized countries from an early period of medical history. Its positive and accurate diagnosis could not be established, however, until the application of the microscope to the study of minute anatomy had become familiar to the profession. The names chosen by Bennett and Virchow are suggested solely by the altered condition of the blood. But the spleen and lymphatic glandular structures are apparently as constantly and extensively altered from their natural condition as is the blood. Hence Trousseau calls the disease adenie; Gresinger, anæmia splenica; Jaccoud, a lymphagenic diathesis; and others have used the terms anæmia lymphatica; splenic leucocythæmia; medullo-splenic disease, etc.

Causes.—The essential causes of leucocythæmia are so obscure as to have, thus far, eluded observation. Literally, nothing is known concerning the etiology of the disease. It occurs most frequently during the active period of adult life, from twenty to forty years of age. But cases have been observed at all stages of life, from childhood to old age. It has been seen much more frequently in the male than in the female sex. It has been claimed that excessive mental and physical labor, and the occupation of damp and poorly ventilated dwellings, acted as predisposing causes. If they do so, it is probably only by lessening the general tone of health, and thereby impairing the resistance to all morbid impressions.

Symptoms.—The early symptoms of the disease are very obscure and ill-defined. They consist chiefly in diminished power of endurance, or unusual weariness, from either mental or physical exercise, variable appetite, with slight impairment of digestion, imperfect or disturbed sleep, nervous excitement and increased cardiac action from slight causes, and a gradually increasing paleness or anæmic hue of the surface. These equivocal and variable symptoms may be noticeable for several months before the development of any swelling or enlargement, either in the spleen or lymphatic glands. Generally, however, in from six to twelve months, the patient begins to present a decidedly anæmic look, and finds so much shortness of breath, palpitation, and sense of weariness from very moderate attempts to exercise, that he is obliged to abandon all active business. He now has frequent temporary paroxysms of fever, with disorder of the stomach and bowels, wandering pains in his head, back, limbs —sometimes vertigo, with dimness of vision, and the urinary secretion is very variable in quantity, being sometimes abundant and pale—at other times less than natural, and deeper color, but without the presence of either albumen or sugar. A careful examination of the patient will now detect plain anæmic or soft blowing sounds over the base of the heart and in the course of the aorta, with habitual frequency and softness of the pulse; but no physical signs of structural change, either in the heart or

lungs. In a majority of cases there will be unnatural fullness of the left hypochondrac region, which can be traced by palpation and percussion, to enlargement of the spleen. In a large proportion of the cases, at this stage, there are found enlargements of the lymphatic glands in the groins, often extending in a chain up the course of the iliac vessels, into the abdomen; and in some cases the same class of glands are enlarged, both in the axilla and neck. From this time or stage in the development of the disease, the health of the patient fails more rapidly. The anæmia, glandular swellings, shortness of breath, and palpitations from slight exertion, all steadily increase. The glandular swellings are generally rounded, freely movable, less hard or dense than the glandular enlargements in scrofula, and varying in size from that of a pea to a hen's egg. The spleen usually continues to increase, until it sometimes fills the whole left side of the abdomen, and, except the natural indentations along the edge, its surface is smooth and but little tender to the touch. In some cases, the liver also becomes enlarged, especially in the advanced stage of the disease. The patient has more frequent attacks of diarrhœa or vomiting, and sometimes both. Hæmorrhages, especially from the nostrils, and in some cases from the gums, bowels, uterus, and kidneys, are of frequent occurrence. Petechial spots appear on the surface, and sometimes considerable extravasations of blood take place into the subcutaneous areolar tissue. In some instances, death takes place suddenly from extravasation of blood into some part of the brain. More frequently death results from serous or dropsical effusions, not only into the areolar tissues and serous cavities, but into the parenchyma of the lungs and other organs, or from persistent diarrhœa. Some, however, linger long, and die from asthenia, or simple exhaustion. Cases differ much in the rapidity of their progress. Some reach a fatal result in five or six months, while others continue as many years. The average duration, as indicated by such cases as have been collated by different writers, is about two years.

Morbid Anatomy.—Post mortem examinations have revealed important changes resulting from the progress of this disease, both in the blood and in several of the structures of the body. The most important and characteristic change in the blood, consists of a large increase in the number of white corpuscles or leucocytes, and a corresponding diminution of the red blood discs. So great is this change that in some cases the number of white corpuscles actually exceeds those of the red. In the great majority of cases, however, the relative proportion varies from one of the white, to ten, fifteen, or twenty of the red corpuscles. Notwithstanding the great increase of the white corpuscles, the decrease of the red ones is relatively still greater; thereby causing the aggregate of corpuscular elements in the blood to be much less than in health.

The greater number of white corpuscles appear of their natural size, but some are smaller, and a few are found much larger and filled with nuclei or granular matter, much like the ordinary giant cells of the lymphoid tissues. These changes make the blood look much paler than natural; and the clots that form to be of a light yellowish color and small; but the proportion of fibrine is moderately increased.

The composition of the secretions generally does not differ in a marked degree from that of health. The urine generally contains an excess of uric acid; and in a small proportion of cases, traces of formic and lactic acids and hypoxanthin have been found. These same substances, together with leucin, tyrosin, and minute, colorless octohedral crystals, first described by Charcot, have been detected in the blood in some instances. But their presence is not constant either in the blood or urine; neither are they pe-

culiar to this disease. Next to the blood, the most marked and constant changes are found in the spleen, lymphatic glands, and medulla or marrow of the bones. These changes are quite uniform in kind but differing much in degree in different cases. They consist of an increase of the lymphoid cells and reticulated tissue and consequent enlargement or hypertrophy of the glandular structures without material alteration of constituents; but the marrow of the bones being inclosed in such a way as to prevent enlargement, the increase of lymphoid cells causes the disappearance of the natural fatty matter, and gives to the medulla a reddish or greenish yellow color and creamy consistence. It is chiefly in the medulla or marrow of the long bones of the extremities, and of the ribs and vertebræ, that these changes have been observed. The excess of lymphoid cells in all these structures vary much in size, some being smaller and others larger than natural. As a rule, the smaller ones predominate in the lymphatic glands, and the larger nucleated and granular cells are more numerous in the medulla of the bones and in the pulp of the spleen. The changes and lymphoid cell accumulations are not limited entirely to the spleen, lymphatic glands, and medulla of the bones, but in very many cases are found to have occurred in a less degree, in the lobules of the liver, the kidneys, the glandular structures of the mucous membrane of the alimentary canal, the brain, the retina of the eye, and the testicles. These structural changes are not found equally developed in all the structures involved in each case. For instance, in many cases they will be very prominent in the spleen, and comparatively slight in all other parts. These have been called splenic-leucocythæmia. In other cases, the lymphatic glands generally have become prominently affected with hyperplasia, while the spleen is only slightly altered. These have been called lymphatic-leucocythæmia. In a smaller number of cases the changes have chiefly occurred in the medulla of the bones, with but little in either the spleen or lymphatic glands; and these have been called medulla-leucocythæmia.*

Special Pathology.—The nature of the primary morbid actions from which result the progressive and persistent alterations in the blood and structures, such as I have just described, are involved in obscurity, on account of our imperfect knowledge of the physiological processes by which the corpuscular elements of the blood are formed in health. That white corpuscles appear in the chyle during and after its passage through the mesenteric glands, and in the lymphatic vessels that take up the colorless fluids from the several tissues of the body, and that such corpuscles are increased during the passage of this fluid through the lymphatic glands, are facts familiar to all of you. But how and where the red corpuscles are formed is still undetermined. For a long time they were supposed to be formed in the spleen. More recently several observers have discovered these bodies in what appeared to be different stages of formation in the medulla or marrow of the bones; and consequently have regarded this as the seat of their formation. This view was thought to be corroborated by the fact that the marrow of the bones was found to have undergone marked changes of structure in many of the cases of leucocythæmia. If post mortem examinations had shown a constant correspondence between the changes in the bone marrow and the degree of diminution of red corpuscles, the evidence would have been of much value. But such is not the fact. On the contrary, in many cases of extreme leucocythæmic anæmia, very little change has been observed in the marrow of the bones; and in a few, none that was appreciable.

* See Nauman, in Berlin Klin. Wochenschrift, No. 6, 1878.

My own observations have led me to think that there are two kinds of white corpuscles, both formed as a part of the assimilative changes which take place in the reticulated tissue or lymphatic vessels and glands. One kind constitute the true migrating corpuscles that accumulate so readily in the vessels of inflamed parts, permeate freely the walls of capillary vessels, and enter directly into the nutrition of the various organized structures. The other kind have less ameboid movement, often attain a larger size and look more granular, and somewhere in their progress, they become permeated with the hæmoglobin and are transformed into red corpuscles. Whether this latter change is completed while they are passing through the marrow of the bones, the pulp and malpighian vessels of the spleen, or while floating in the mass of the blood, cannot be positively determined in the present state of physiological science. Be this as it may, however, I am satisfied that the first and essential step in the pathology of leucocythæmia consists in the failure to complete the transformation of white into red corpuscles. Whether this results from some imperfection in the properties of the white corpuscles by which they fail to attract the hæmoglobin; or whether the latter is itself deficient, cannot be readily determined. The failure to complete the conversion of the white corpuscles into the red, allows the former to accumulate in the blood and in the adenoid or reticulated tissues, causing slow hypertrophy of some part or all of the latter, as seen in the ultimate enlargements of the spleen, lymphatic glands, marrow of the bones, etc. At the same time, as new red corpuscles cease to develop, and those already existing slowly disappear, the resulting impoverishment brings steadily increasing paleness, muscular weakness, incapacity for active exertion, shortness of breath, palpitations, and general functional derangements.

That the diminution of the red corpuscles is the result of failure in some part of the processes by which they are developed, and not from an increase in the rapidity of their destruction, is evident, from the fact that at no stage of the disease do we find an increase of the products of such destruction in the form of dark granules or melanotic deposits, such as appear so abundant when they are undergoing increased destruction from malarious influence.

Diagnosis.—In its early stage, leucocythæmia is liable to be confounded with various other spanæmic conditions of the blood, and impairments of nutrition; such as scrofula, chlorosis, pernicious anæmia, etc. From all these, however, it is distinguished with much certainty by the presence of an increased number of white corpuscles, and a corresponding diminution of the red, as shown on the field of the microscope. As the relative proportion of both red and white corpuscles, varies much in different individuals and in different morbid conditions, it becomes desirable to determine the degree of change that shall be regarded as certainly indicating the presence of the disease under consideration. If a proper examination of the blood shows the presence of one white to twenty red corpuscles, most writers regard it as sufficient evidence of the presence of leucocythæmia.

But the ratio of the white to the red corpuscles in healthy blood, does not exceed one in from five hundred to one thousand; and if you have a patient with the early general symptoms of leucocythæmia, and on examining the blood you find one white to fifty red globules, and at two or three subsequent examinations at intervals of one or two weeks, you find a progressive ratio of increase in the number of white ones, you will be safe in regarding the diagnosis as established. For the steadily increasing ratio of the one relatively to the other, through a given period of

time, is quite as important in a diagnostic point of view, as any arbitrary standard of such ratio.

Prognosis.—Whatever may be the nature of the morbid condition by which the white corpuscles are prevented from further development into red ones, when once established, it usually persists in opposition to all efforts hitherto made for remedying it, until the life of the patient is destroyed. The most obvious fault, is the failure in the production of hæmoglobin and its union with the other elements of the colored corpuscles. But no methods of treatment have yet been successful in remedying this defect, or in materially modifying the progress of the disease. Consequently, the prognosis in well marked cases of leucocythæmia must be regarded as uniformly unfavorable.

Treatment.—Seeing the pallor and general weakness of the patient, you will naturally turn with some confidence to the use of fresh air, good food and ferruginous tonics, as in other forms of anæmia, with the expectation of improving the nutritive processes and checking the progressive impoverishment of the blood. At the same time the enlarged spleen and lymphatic glands will suggest the use of iodine, quinine, arsenic, and other alteratives. But, gentlemen, all these remedies, and many more, aided by change of air and climate, have been perseveringly used, without obtaining any permanent control over the progress of the disease. Those who regard the disease as having its origin in the spleen, have resorted to a liberal use of quinine, ergotine, iron, iodine, mercurial inunction and electricity, with the hope of reducing the size of that organ, and thereby arresting the further involvement of the system generally. Finding remedies unavailing, the spleen has been extirpated in several cases, but with uniformly fatal results, either from hæmorrhage or peritonitis. Remedies addressed to the lymphatic glandular enlargements have been attended by no better results. In the present state of knowledge on this subject, I can give you no better advice, than to examine carefully the sanitary history, habits and surroundings of your patient, with a view to the detection and removal of all influences that could affect unfavorably, either the assimilative or excretory functions, or the healthful tone of the nervous system. Let the sleeping room be of good size, dry, well lighted and well ventilated. Let the diet be plain, easily digestible, and embracing sufficient variety for supplying all the elements necessary for perfect hæmatosis and nutrition. Let the exercise be habitually in the open air, by riding or walking, as best suits the strength and comfort of the patient; and after every ride or walk, let there be at least half an hour of full rest in the recumbent position. If the patient has long resided in the interior and has the means for traveling, let him visit, and tarry during the warm months at the seaside. If his residence is near the sea, let him change to the mountains; or if on a damp and malarious soil, let him move permanently to one moderately elevated and dry. So far as possible, let the social surroundings of the patient be such as to promote mental cheerfulness and hope. All these items are worthy of the most careful attention, especially in the earlier stages of the disease.

For direct medication I should rely much upon the tonic and alterant influences of the following formulæ:

℞	Hydrargyri Chloridi Corosivi	0.066 grams	gr. i
	Tincturæ Cinchonæ Compositæ	90.000 c. c.	℥iii
	Elixir Simplicis	30.000 " "	℥i

Mix. Give four cubic centimeters, (fl ʒi) in a little water just before

breakfast, dinner and supper. To supply materials for the hæmoglobin I give half an hour after each meal, an ordinary dose, of either the syrup of lacto-phosphate of iron, the pyrophosphate of iron, or the compound syrup of the hypophosphites. One of these may be given until the patient becomes weary of the same impression and then exchanged for another. And to lessen the danger of inducing any effect of the mercurial on the mouth or salivary glands, the bichloride may be omitted from the formula I just gave, during every third week.

Another measure worthy of persevering use, is the application of electricity. This should be done, sometimes by insulating the patient and charging the system moderately, and more frequently by giving the patient the positive pole in one hand, the operator taking the negative in one of his, and then making the connection by frictions with the other over the spleen and the various lymphatic glandular enlargements. To obtain the maximum of influence, the applications should be continued from ten to twenty minutes once each day. Such is the general course of management which I have found most beneficial in the limited number of cases that have come under my own observation. Of course due attention must be given to the palliation of some of the more distressing symptoms as they occur. Hæmorrhages, diarrhœal attacks, palpitations, etc., must be temporarily met by appropriate remedies; and in malarious districts the judicious use of quinine, either alone, or in combination with iron and strychnia may be of great advantage.

PSEUDO-LEUCOCYTHÆMIA.

Very closely allied to the disease I have just considered, if indeed it be not a mere variety of the same, is the *pseudo* or false leucocythæmia of recent writers. It was first described as a distinct disease, and differentiated from ordinary scrofulous affections by Dr. Hodgkin in 1832.

His descriptions, however, included all cases in which there were associated special enlargement of the spleen, with more or less hypertrophy of the lymphatic glands. It was not until thirteen years later, that Bennett and Virchow separated the cases characterized by excess of white corpuscles in the blood from those having no such excess, and gave to the first the name of leucocythæmia or leukæmia, and leaving the latter to be called pseudo-leucocythæmia or Hodgkin's disease. The clinical history, or symptoms and progress, of the two diseases, present no constant or essential differences. In the pseudo-leucocythæmic form of disease, you have the same obscure beginning, and subsequently the same progressive anæmia or impoverishment of the red corpuscles of the blood, loss of strength, shortness of breath, palpitations, and hypertrophies of the spleen and lymphatic glands; and in the advanced stage, hæmorrhages, diarrhœas, dropsical effusions, etc.; and the same persistent tendency to a fatal result. The only positive condition on which a differential diagnosis can be based, is the want of a sufficient number of white corpuscles in the blood to come within the rule adopted as necessary to constitute true leucocythæmia. In a majority of the cases classed as Hodgkin's disease there is more extensive hypertrophy of the lymphatic glands and reticulated or adenoid tissues throughout the system, except in the medulla of the bones; which latter, however, has not yet received as much attention as Nauman and others have bestowed upon it in the cases of leucocythæmia. The density of the enlarged glandular structures differs much in different cases. In some they are comparatively soft, while in others they are quite hard and

round. In the softer cases the increased growth is owing mostly to the accumulation of lymphoid cells with but little increase of the fibrous or connective tissue, while in the hard variety the reverse is the case. But in neither is there any deposits or new material differing from the natural elements belonging to the lymphatic or reticulated tissues; and both are distinguished from the scrofulous enlargements by the absence of all tendency to either caseous or purulent degeneration, and from cancerous growths by the absence of any tendency to permeate and absorb into the tumors any and all surrounding structures, or to end in open offensive ulcerated surfaces. The fact that in pseudo-leucocythæmia the spleen, lymphatic glands and other adenoid structures, are even more enlarged from the accumulation of white corpuscles and lymphoid cells, than in leucocythæmia, while the blood itself contains no notable increase of these bodies, would seem to show that their existence in the blood in such excess in cases of the last named disease, is not owing to their having been developed in these hypertrophied tissues and pushed out into the blood, as supposed by many writers; because careful examinations have shown that the vessels and ducts of the glandular structures are as free for them to make their exit in the one form of disease, as in the other.

From a careful comparison of the clinical history and morbid anatomy of these two diseases, I am satisfied that they are only varieties or gradations of one and the same general morbid condition. There is the same failure in the production of hæmoglobin and red corpuscles in both; while in the cases classed as leucocythæmia the white corpuscles continue to be formed faster than they can be used in the excessive growth of the glandular structures, and consequently accumulate in the blood; and in those classed as pseudo-leucocythæmia the growth of the glandular and adenoid structures absorb them as fast as they are formed. This does not indicate that the latter disease is any milder than the former. On the contrary, its average duration before reaching a fatal result, is somewhat less. As there is nothing more known concerning the causes, pathology, and treatment, of the pseudo, than of the true leucocythæmia, all that I have said in regard to the hygienic and remedial management of the latter is equally applicable to the former. Under the impression that the disease had its primary seat in the lympho-sarcomatous tumors or hypertrophied glands, some efforts have been made to reduce these by electrolysis, but without encouraging results. Under the same impression, some surgeons have extirpated the entire growths, without perceptibly interfering with the progress of the disease. The only cases in which surgical operations are justifiable, are those presenting some one or more tumors, so situated that their pressure directly interferes with some important function, as when they crowd upon the larynx, trachea, or œsophagus.

PERNICIOUS ANÆMIA.

Cases are occasionally met with, presenting the same persistent anæmic condition, or loss of the hæmoglobin, as in the two diseases just described, but without the increase of white corpuscles seen in leucocythæmia, and without the enlargements of the spleen and lymphatic glands accompanying pseudo-leucocythæmia. These have been grouped, by most recent writers, under the name of *pernicious anæmia*. They occur most frequently between the ages of twenty and thirty-five years, and somewhat more frequent in females than in males. It has been alleged, that frequently recurring pregnancies, protracted nursing, severe hæmorrhages, insufficient food, and too much exposure to wet and cold, act as causes

favoring the development of this form of anæmia. At most, however, they can only be regarded as predisposing influences, while the efficient cause is unknown. Indeed, one of the chief characteristics of this group of cases, as alleged by most writers, is that the condition of the patient is not to be explained by the presence or action of any of the well known causes of simple anæmia. The disease was mentioned by Andral as early as 1823, but was first accurately and fully described by Addison, under the name of idiopathic anæmia. Lebart called it "essential anæmia;" Beismer, "progressive pernicious anæmia," while Flint, Pepper, and others, with more propriety, call it "pernicious anæmia."

Many writers regard it only as an extreme or unusually severe form of ordinary anæmia, and it must be acknowledged that there is no very clear line of distinction, either in the symptoms or in the pathological changes between the simple and the pernicious.

Practically, the diagnosis is based mainly on the fact that ordinary cases of anæmia are traceable directly to some prior pathological condition, such as excessive loss of blood, insufficient food, malaria, amenorrhœa, etc., while those called pernicious arise without any such manifest preceding conditions.

Symptoms.—Consequently, if you see a patient with pallid countenance, soft, quick pulse, pale, clean tongue, variable appetite, with occasional nausea and temporary turns of diarrhœa, loud blowing sounds over the base of the heart and aorta, synchronous with the systole; shortness of breath on attempting active exercise, great sense of weakness, with occasional feelings approaching syncope, and learn that these symptoms have developed gradually and persistently without any manifest cause, you will be justified in regarding the disease as pernicious anæmia, and may reasonably expect all the symptoms connected with respiration, circulation and hæmatosis to increase, regardless of your treatment, until temporary exacerbations of fever, hæmorrhages and dropsical effusions determine a fatal result, or the patient dies suddenly from failure of the action of the heart. In the advanced stage of this variety of anæmia, hæmorrhagic extravasations not unfrequently take place in the retina, causing suddenly, partial or complete blindness. In the same stage, the muscular force of the heart becomes so impaired and irregular, in many cases, that the slightest exertion brings vertigo, ringing in the ears, nausea and approaching syncope.

Morbid Anatomy.—Post mortem examinations reveal apparently the same changes in the blood as in pseudo-leucocythæmia, only more exaggerated. The corpuscular elements, both white and red, are extremely reduced in number, while those remaining of the latter, contain one-third less of hæmoglobin than natural. In two or three instances reported, the spleen was moderately enlarged, but in none have the lymphatic glands been materially altered from the natural size. Fatty degeneration of the muscular structure of the heart has been found in a large proportion of cases, and sometimes dilatation with thinning of the walls of the ventricles. Several investigators have reported changes in the marrow of the bones similar to those found after death from leucocythæmia.*

Changes of less importance have been found in many other structures, but only such as are common in all cases of extreme anæmia.

Treatment.—The general indications for treatment, both hygienic and medical, are the same as I have detailed in regard to the management of

*See, paper by Dr. Wm. Pepper, in Amer. Journal of Med. Sciences for April, 1877.

leucocythæmia. The absence of spleenic and glandular enlargements, leaves less indication for the use of iodine and mercurials, either internally or for local application. But in all other respects the treatment must be essentially the same. Transfusion of blood has been tried in several cases, both in this country and in Europe. Dr. C. Carey reports a case in the Buffalo *Medical and Surgical Journal* for January, 1881, which recovered, after receiving, by transfusion, two fluid ounces of human blood. In nearly all the cases, however, in which this measure has been resorted to, no apparent benefit was obtained. In a communication to the *Medical Press and Circular* for October, 1879, Dr. Austin Welden claims to have cured *four cases* by the intravenous injection of milk. To complete a brief consideration of the group of persistently fatal anæmias, I must direct your attention to one more aspect which they assume, as first differentiated and accurately described by Dr. Thomas Addison, in 1855, and by him called *bronzed skin disease*, but since, generally called

ADDISON'S DISEASE, OR MELASMA SUPRA-RENALIS.

This form of disease occurs most frequently in the early part of adult life, and much oftener in males than in females. Since the publication of Dr. Addison's views, the disease has been carefully investigated by Drs. Wilks, Greenhow, Letulle, and others, but without adding materially to our knowledge concerning its causes, pathology, or treatment. Its early stage is characterized by the same obscure symptoms as in pernicious anæmia. The patient experiences a gradual loss of strength, or ability to endure either mental or physical exercise; his appetite becomes variable, with occasional turns of nausea or diarrhœa; he gets shortness of breath, palpitation, and sometimes vertigo, from slight exertion, without any appearance of emaciation; his countenance becomes pale, his pulse frequent and weak, with slight anæmic cardiac murmurs, yet the tongue remains moist and clean, and the secretions generally natural. In many cases, there are dull pains in the back and limbs, with temporary paroxysms of fever. The only symptom that will enable you to distinguish these cases from all the other forms of anæmia, is the development of dark, bronze-colored spots on the cutaneous surface. They generally appear early in the progress of the disease, and are most noticeable on the forehead, front part of the chest and abdomen, and on the backs of the hands. They are at first light brown, and vary much in size and shape, but they generally increase in size, and deepen in color, as the disease advances, until, in some cases, a large part of the whole cutaneous surface is a deep bronzed hue. In other cases the spots are small and few in number, but equally characteristic in color. Similar discolored spots also, in some cases, appear in the mucous membrane of the mouth and fauces.

In the majority of cases the disease advances steadily, causing the sense of exhaustion, the disturbances of circulation and breathing, and the turns of gastric and intestinal irritation, to be more frequent and severe until the patient dies from asthenia in from six months to two years; the average duration being about eighteen months. Yet occasionally a case occurs in which the progress of the symptoms is apparently suspended for several months at a time, thereby protracting the whole duration to five or six years. Two such cases have come under my own observation. Both were men between 35 and 40 years of age. One of them had been exposed to much hardship and confinement in close air, on board one of the iron monitors in active service during the recent war.

Some symptoms of the disease appeared soon after the war closed, as

early as 1865. But they progressed so slowly, with several periods of apparent suspension, that the fatal result was not reached until 1875. I did not see him until near the fatal result. The discolorations of the skin over the abdomen and lower part of the chest, were strongly marked; and but little less so over the forehead, temples, and backs of the hands. For several months he had been unable to walk across his room without extreme feelings of exhaustion, and the final collapse resulted from protracted diarrhœa and vomiting.

A post mortem examination showed the body not much emaciated; the blood in the heart pale and only partially coagulated; the liver and spleen of normal size and color; the mucous membrane of the stomach and ilium congested, softened in some places, with abrasions; but no other morbid appearances were noticed except in the suprarenal capsules. Both of these were enlarged to more than twice their natural size. One of them I here show you from the pathological collection in the college museum. It has been laid open by an incision directly through the center, and you see it composed of two distinct parts. The exterior is composed of gray fibrous tissue, with spots and streaks of yellowish color, firm in texture, and distended into the form of a sac, enclosing a mass of caseous matter, more than twenty-five millimeters (one inch) in diameter, and about the consistence of new cheese, except a thin layer on its circumference next to the capsule which was nearer the consistence of thick cream. The central mass appears to be identical in all repects with the caseous matter found in scrofulous glands, while the gray fibrous tissue of the capsule shows, under the microscope, fuciform, lymphoid, and large granular or giant cells, in considerable numbers.

The other capsule was similar to this, both in size and texture. This was in all respects a typical case of the disease, and its post mortem appearances well illustrated the essential pathological changes resulting from it in the great majority of cases. In some, however, the mesenteric glands, in the vicinity of the suprarenal capsules, have been found enlarged, with partial caseous degeneration; in a larger number either tubercular or caseous deposits have been found in the lungs; and in a very few, the spleen has been moderately enlarged. One or two cases are on record, in which the marrow of the bones was changed as in leucocythæmia.

The three most constant and essential anatomical changes are, the anæmic condition of the blood, the bronzed color of the skin, and the degeneration of the suprarenal capsules. Yet two or three well authenticated cases have been reported, in which all the constitutional or general symptoms, and the characteristic bronze color of the skin were fully developed, but in which the post mortem examination showed the suprarenal capsules, entirely free from any appreciable morbid change. Much difference of opinion has been expressed in regard to the nature of the disease under consideration. Some regard the suprarenal capsules as the primary seat of the disease, and the general symptoms as secondary. Others, among whom are Virchow, Greenhow, etc., claim that all the symptoms arise from irritation of the sympathetic nerves and ganglia in the vicinity of the capsules. I think that all the facts connected with the clinical history of the disease, are best explained by placing it in the same category with leucocythæmia, pseudo-leucocythæmia, and pernicious anæmia; and regarding the failure in the processes of assimilation, by which the hæmoglobin and corpuscular elements of the blood become deficient as the primary and essential pathological condition, while the changes in the skin, suprarenal capsules, etc., etc.,

are secondary. Much the same view has been expressed by Dr. Wm. Pepper, who regards the disease as primarily a profound impairment of the blood-forming function. Neither from my past clinical experience, nor from the known pathological changes which take place in the blood and tissues during the progress of the disease, can I give you any better suggestions for its treatment than those made in reference to the management of leucocythæmia and pernicious anæmia. They are all summed up in the use of such means, hygienic and medical, as are best calculated to restore the function of hæmatosis, and palliate the more distressing symptoms as they arise.

LECTURE XXX.

Carcinoma—Its Local Varieties, Anatomical Structures, Modes of Development, Diagnostic Features Prognosis and Treatment: Constitutional Syphilis—A brief allusion to the varieties of its manifestation, and the most reliable methods of treatment.

GENTLEMEN: In the list of constitutional diseases I enumerated carcinoma, or cancer, and in doing so, I alluded to its acknowledged hereditary character as the chief evidence that it was derived from a prior special diathesis. I am aware that a large proportion of both pathologists and practical surgeons, at the present time, regard all the varieties of cancer as primarily of local origin, and represent the general failure, or cachexia as secondary, and directly dependent on the diffusion of cancer cells from the point of their local origin. They freely admit its capability of hereditary transmission; and even allege this as its chief mode of propagation, leaving us to infer, from their expressions, that there is a specific germ transmitted which finds lodgment in the new being, as the nucleus of a future local morbid growth. It is not difficult to conceive the possibility of having the germinal cell of the ovum, or the spermatozoæ of the semen, impressed with the same deviation from the natural condition of the properties inhering in each atom of living matter belonging to the parent in which such germinal cells or spermatozoæ was originally developed; and that such deviation in the properties constituting the formative forces might ultimately so increase as to develop such changes both in the production and arrangement of cells and tissue elements, as to constitute morbid growths. But that a specific cancer germ should be thus transmitted, and retained through a period of forty or fifty years, and then become the nucleus of a local cancerous growth, is certainly very difficult to comprehend. To my mind, the generally admitted hereditary character of the disease, coupled with the persistent tendency to reproduction after the extirpation of the local tumors, constitute sufficient evidence that, however obscure it may be, there is a special constitutional condition that predisposes to the development of the local morbid growths. That such diathesis or constitutional tendency is not characterized by any appreciable symptoms, I admit. But the same is true of the tuberculous, gouty, and rheumatic diatheses; yet no one appears to doubt the existence of such diatheses on that account.

Causes.—Aside from hereditary influences, the causes of carcinoma are

but little understood. My own observations and study have led me to the conclusion that the free use of tobacco, alcoholic drinks, and meat, have some influence in favoring the development and progress of this form of disease. I think a careful analysis of vital statistics will show that the people of those countries in which these several agents have been most freely and universally used, furnish the highest ratio of deaths from the different varieties of carcinoma. Statistics also indicate that density of population exerts a predisposing influence. Still we have very little accurate knowledge concerning the causes of any variety of cancerous disease.

Varieties.—The local developments of cancer, present such differences in their appearance, density and rapidity of growth, as to constitute several varieties. Those most generally recognized are the scirrhus, encephaloid and colloid. The first is charcterized by great density of structure and generally, slowness of growth. The second is softer to the touch, more rapid in growth, and generally attains much larger size. The third is intermediate both in density of structure and rapidity of development. These several varieties are not made up of essentially different structural elements nor do they depend altogether on the character of the structure in which they are developed. It is true that the scirrhus, or hard variety is found most frequently in the skin, the female breast, the uterus, the stomach, and the lymphatic glands ; the encephaloid in the liver, kidneys, structures of the eye and brain ; and the colloid in the peritoneum, mesentery, and intestines. When any of the varieties of cancer originate in the epithelium of the skin or mucous membranes, it is generally called an epithelioma. When in the structure of bone it is called an osteo-sarcoma.

Anatomical Structure.—Soon after the microscope was applied to the study of minute organic structures, both healthy and morbid, it was thought by many observers that cancerous growths contained characteristic cells, peculiar to themselves and sufficiently distinctive to constitute a reliable diagnostic feature. Minute descriptions were given of these supposed peculiar cells, and of their mode of multiplication and diffusion. And you still find in all your books expressions used in relation to *cancer cells*, which fairly imply some peculiarity in their character. But it is now universally admitted that there are no cells or other organic elements peculiar to cancerous growths. On the contrary, they all consist of essentially two structural elements, namely, cells, and fibrous, or connective tissue. The cells vary in size and shape, but, as a rule, closely resemble the natural epithelial cells of the tissue in which the cancerous growth originates. They are usually larger than the leucocytes of the blood, and contain either nuclei or granules. The fibrous tissue, which constitutes the matrix, in the meshes of which the cells are collected, presents no characteristics which will enable you to distinguish it from the connective tissue of healthy structure.

The principal features of a cancerous structure, which distinguish it from other structures, are not any peculiarity in the form or appearance of either the cells, or the fibrous structure, but in the relations which these two tissue elements bear to each other. The fibrous structure is so arranged as to leave interspaces or alveoli of varying size and shape, and the cells, instead of being somewhat equally distributed along the fibres, are, for the most part, collected into clusters in these alveoli. This arrangement is characteristic of all the varieties of cancer, and gives to the cut surface, when magnified, the appearance of clusters of cells, varying in size and number, with intervening bands of fibrous structure. In the scirrhus, or hard cancer, the fibrous tissue predominates, and the alveoli containing cells are small; which has caused this variety to be called by some

observers, fibro-carcinoma. In the encephaloid or soft cancer, the fibrous tissue is less abundant, and the alveoli or interspaces are much larger, and the cells correspondingly more abundant. Hence it has been called, medullary-carcinoma. The colloid variety also contains less fibrous tissue than the scirrhus, but the alveoli contain a less number of cells than the encephaloid, the deficiency being supplied by an unorganized gelatinous material, which has caused this variety to be called, gelatiniform carcinoma. There is also in all the forms, a modification of this gelatinous material, which may be pressed out of the cut surface of fresh cancer structure, and is often called *cancer-juice*. In the scirrhus variety the quantity of this fluid is very small. All cancerous structures contain some vessels and nerves, and when the integument gives way over the prominent part of the softer varieties, a very rapid and highly vascular fungus growth is developed, which bleeds on the slightest touch. In former times such cases were called "fungus-hæmatodes." In the progress of development or growth, the cancerous structure exhibits a constant tendency to invade and convert into itself, all other structures with which it may be in contact. It does not merely push them aside to make room for itself, like other tumors, but rather absorbs them into itself. In addition, the cells appear to follow the lymphatic vessels into the neighboring lymphatic glands, causing in them secondary cancerous growths. A similar extension may also take place along the blood vessels, causing many little masses or nodules to form in the vicinity of the original growth, more especially when the cutaneous surface is involved.

Diagnosis.—From what I have already said, you will readily infer that the chief diagnostic features common to all cancerous tumors, are the aggregation of the cells in clusters, filling the alveoli or spaces formed by the interlacing of the fibrillated structures; the indiscriminate conversion of adjacent structures into a part of itself; The induction of secondary growths in the neighboring glandular structures, and its persistent tendency to deteriorate the general health, and ultimately to destroy the life of the patient. While these features are sufficient to enable you to diagnosticate the various external or superficial cancerous growths, they are not available, except to a limited extent, when the diseased mass is developed in the parenchyma of internal organs. In the latter cases there must be added a careful comparison of their clinical history in each tissue or organ, with that of other local affections in the same parts. This can better be done in connection with the consideration of local diseases than at present. Yet there are certain clinical phenomena, pretty uniformly present in the several stages of all internal cancerous affections, which are sufficiently distinctive to merit your attention:

1st. When once begun, there is a degree of uniformity and persistence in the symptoms accompanying the local development of a cancerous disease, that does not characterize either functional disturbances or chronic inflammations in the same parts.

2nd. The pain in cancer is rarely continuous unless from direct pressure of the tumor on surrounding sensitive parts, but is lancinating, of short duration, and recurs at irregular intervals. There is also less tenderness to pressure or percussion than in chronic inflammation.

3d. There is a progressive impoverishment of the red corpuscles of the blood, causing a steadily increasing pale or sallow color of the surface, with little emaciation, and generally no increase of temperature or frequency of pulse. When the disease is located in the stomach, however, the emaciation becomes more marked, especially in the advanced stage, on account of the inability to take and assimilate food.

4th. At some stage in the advancement of the disease, it causes sufficient

enlargement of the structure or organ in which it is located, to be capable of detection by palpation and percussion, when its location, size, density, and other physical qualities, will aid in rendering the diagnosis certain.

Prognosis.—The tendency of all true cancerous affections is to steadily increase, both in local development and in general impairment of the health, until the life of the patient is destroyed. The rate of progress varies much in the different varieties of carcinoma, and is also influenced, in some degree, by the character of the structure involved. As a rule the scirrhus variety progresses much slower than the encephaloid; and the more vascular the tissue in which the local growth originates, the more rapid is its progress. Some rare cases have been observed in which the cancerous structure appeared to undergo partial fatty degeneration with some diminution of size, and then remain stationary for several years. But it may be said properly, that there is no tendency to a spontaneous cure by complete resolution or disappearance of the cancerous structure. Neither does there appear to be any hygienic or medical treatment known that is capable of affecting a cure with any degree of certainty. I have seen a considerable number of cases of scirrhus of the breast, and of some other parts, relieved entirely of pain and their growth much retarded, by confining the patients to a milk and vegetable diet, and excluding meat, with the protracted use of certain medicines. The fact that cancerous growths have neither a tendency to spontaneous cure, nor to disappear under medical treatment, has caused them to be very generally placed in the hands of the surgeon for extirpation; and not a few go to pretended "cancer doctors," to be murdered by caustics under the name of cancer salves and plasters, or to be occupied a few months in drinking *clover tea*, or some other equally harmless infusion.

If the cancerous tumor is so located that it can be safely removed, the surgeon generally proceeds at once to extirpate it as completely as possible, without any special preparatory or subsequent constitutional treatment. The result is, that, except in the mildest form of cutaneous epithelial cancers, such as occur most frequently on the lip, the disease returns in from four months to three years, and causes a more rapid failure of the patient than before the operation. Consequently, so far as permanent results have been obtained, they are no better from surgical than from medical treatment.

This leads us directly to the question whether there is any treatment that is capable of either mitigating or curing cases of the true cancerous forms of disease? My own clinical observations would not justify me in giving an unqualifiedly negative answer to this question.

Treatment.—And yet there is great difficulty in arriving at just and reliable conclusions concerning it. This arises from the fact that nearly all the methods of treatment adopted, have been founded on the idea that cancers originate locally from some specific germ or cell, the multiplication of which not only causes the morbid growths, but also the general failure of health by their diffusion in the blood. The logical inference from this pathological view, is, that the earlier the local tumors can be removed the less danger will there be of either constitutional impairment or renewal of the local growth.

Hence, the chief anxiety of the surgeon has been to operate *early* and to remove *all* the visible cancerous tissue, as the only hope of cure. And in cases where surgical procedures were not admissible, the leading thought has been to find some *specific* that would be capable of such administration as to destroy the supposed cancer cells or germs in the system. So prominent was this idea of finding some specific remedy capable of curing

or destroying the cancer germs, that more than a quarter of a century since, the late Dr. Daniel Brainard, of this city, after numerous experiments thought he had found such a specific in the lactate of iron, a solution of which he found very active in dissolving pieces of cancerous tumors. He also ascertained by careful experiments on dogs, that a weak solution of the lactate of iron could be safely injected into the veins of the living animal.

With these preliminary facts ascertained, he became very confident that cancers could be permanently cured by removing with the knife all the visible cancerous tumors, and then destroying the cells or germs remaining in the blood by the intra-venous injection of a solution of lactate of iron. He made a fair trial of this method in, at least, two cases that came under my own observation. One was an adult male, with a well developed encephaloid tumor, originating in the eye-ball, and occupying the whole cavity of the orbit. He removed the diseased mass very perfectly by the usual operation, and injected a solution of the lactate of iron into the venous blood through the vein in the arm, which is usually opened in performing venesection. The injection was repeated two or three times, at intervals of from four to six days. The wound in the orbit granulated and healed up, with a healthy appearance, and the case was reported, and published in the *American Journal of Medical Sciences*, as permanently cured by extirpation and intra-venous injection of lactate of iron. Unfortunately, however, before the ink was fairly dry on the pages of the journal, the cavity of the orbit was being again rapidly filled with a renewal of the cancerous growth, and in about eighteen months the patient died from the effects of the disease.

The other case was a well developed scirrhus in the breast of a female aged about fifty years. The whole breast was removed by an operation, and the solution of lactate of iron injected through the vein in the arm, as in the previous case. Before the end of the first week after the operation, symptoms of septicæmia supervened, and the patient died.

I think the same treatment was tried in two or three other cases, without encouraging results, and was abandoned.*

The very recent confident assertions of a Dr. De Clat concerning the curability of cancerous and other malignant diseases, by the use of pure phenic or carbolic acid, are founded on the same idea of specific cancer cells or germs and specific remedies for their destruction. And it is safe to say, that whoever resorts to his particular remedies and methods of using them, will soon demonstrate their entire inefficiency. Indeed, it is only a few days since, that I was called to see a lady who had suffered severely from a well marked scirrhus tumor in the pyloric portion of the stomach. I learned that for about three months past, she had faithfully used the exact remedies and methods of treatment recommended by Dr. De Clat. She had used one preparation by the mouth, another by hypodermic injection, and a third by inhalation. Yet they had exerted no apparent effect on the progress of the disease; certainly no mitigating influence, for she had steadily failed or grown worse in all respects. It is now generally conceded by the most experienced microscopists and minute anatomists, that no peculiar germs, nor specific cells, have been

* A fact worthy of notice, for the guidance of other experimenters, was ascertained during the trials of lactate of iron in solution for intra-venous injection. So long as the operating surgeon succeeded in introducing the solution wholly into the current of venous blood, it appeared to produce no noticeable disturbing effect. But twice the operator, by mistake, injected some into the areolar tissue outside of the vessel, and once without mistake, but for a purpose, he injected it into the popliteal artery. In the two first it speedily destroyed every vestige of the areolar tissue with which it came in contact; and in the last, being carried with the arterial blood directly into the capillaries of the leg and foot, it rapidly induced in them an inflammation so intense as to jeopardize the patient's life.

discovered in any of the varieties of cancerous structure. On the contrary, the cells and fibrous tissue composing the various cancerous growths, are either identical with, or only modifications of the natural epithelial cells and connective tissue of the part in which the cancer is located. The peculiar aggregation of the cells, and their modification, const tuting the cancer structure, is doubtless the result of a morbid condition of the *properties* which control the primary forms of organization, either derived from hereditary influence or the slow and persistent action of such causes as are capable of modifying the processes of assimilation and cell evolution. This view would lead us to expect better results from the persistent adherence to proper hygienic regulations, and the use of such remedies as are capab'e of modifying the elementary properties of the tissues, than from either specific medication or simple surgical extirpation, or both combined. The direct removal of an existing morbid growth or tumor by either knife or caustic, does not in any degree change either the quality of the blood or the properties that govern the development of tissue elements and their aggregation into definite structures. And if these remain unaltered, there is every reason to suppose that they will sooner or later lead to the same result, namely, the renewal of the morbid growth in the same or some other place. A supposition which is in direct consonance with all past experience.

The rational indications then, are, to put the patient upon such diet and mode of living, aided by such general alterants, as will be best calculated to change the properties governing the development of tissue elements, and especially the epithelial cell formations. If, by such management, the cancerous growth ceases to be painful and remains stationary in size for two or three months, and is so situated that it can be safely removed, it should then be extirpated as completely as possible, and the hygienic and general medical treatment continued faithfully for one or two years. By thus first altering the quality of the blood and the properties controlling tissue growth, then extirpating the morbid structure already developed, and continuing for a long time subsequently the same modifying influences as at first, you will give the patient the best possible chance for a permanent cure. But you are doubtless ready to ask whether I have any evidence that the progress of true cancerous diseases can be materially influenced either by hygienic or medical treatment? I am confident that such evidence is in my possession, especially in relation to the scirrhus or hard variety of cancers. The encephaloid cases appear to be much less under the control of any measures yet devised. At an early period I saw the opinion expressed by some one worthy of credit (perhaps by the elder Dr. Jackson, of Boston, in one of his letters to a young physician), that adherence to a diet of milk, farinaceous articles, vegetables and fruits, excluding meat, would much retard the progress of malignant tumors. Acting in part upon this suggestion, in 1848, while residing in New York City, I took charge of a poor woman who had presented herself in the surgical clinic of Dr. Willard Parker, and had been dismissed with the opinion that surgical interference was inadmissible, as both breasts were nearly destroyed by open scirrhus cancers, and what soft parts were left, were closely adherent to the ribs. I advised her to adhere rigidly to the diet just mentioned, use tea and coffee only lightly, and nothing of fermented or distilled drinks.

I gave her the bichloride of mercury in doses of two milligrams (gr. 1-32) three times a day, generally in connection with some simple bitter infusion; and instructed her to keep herself supplied with fresh stramonium ointment with which to dress the open cancerous ulcers morning and

evening. She made the unguent by simmering fresh stramonium leaves gathered from the roadside, with lard. The patient carried out my instructions faithfully and patiently for little more than twelve months, during which time the local cancerous disease had ceased to be painful, and instead of extending, actually showed some limited places of cicatrization, and her general health was improved. I then removed from the city and know not what became of the case afterward. Since that time I have had an opportunity to note the effects of a simple milk and vegetable diet, without meat, accompanied by good air, and the use of small doses of either the bichloride of mercury or the arseniate of sodium with conium, internally, in a large number of cases of carcinomatous disease. And in no case of the hard variety of cancer, except when located in some part of the stomach, have I known the treatment fail to relieve the pain and arrest the growth in less than two months; and the gain thus made was usually retained as long as the treatment was continued.

But in no case was I able to obtain more than a slight reduction in the size of the local cancerous tumor. And such is the anxiety felt by most patients so long as they know the tumor remains, and so frequent the interference of friends in advising this specific or that doctor, as certain to cure, that only a very small proportion of the whole number of patients have adhered faithfully to the prescribed diet and medicines more than three or four months without interruption. And even in those cases, in which, after one or two months of preparatory treatment, the tumor has been removed, so soon as the wound has fairly healed, and there is a fair appearance of recovery, the great majority will at once return to a promiscuous diet and abandon further treatment as unnecessary. Among my patients I have found a few exceptions to the general rule. At least twenty years since an intelligent married woman, aged thirty-eight years, from a neighboring state, came to me with a well marked scirrhus cancer in the right breast. The tumor was about fifty millimeters (two inches) in diameter, occupying the central part of the mammary gland, causing retraction of the nipple, and some adherence of the integument to the hard mass. It was but little sensitive to the touch, but was subject to occasional lancinating pains, and had been gradually increasing in size since it was discovered, about eighteen months previous. The patient was thin in flesh, but otherwise in apparent good health. The cancerous affection was hereditary in her family, both her mother and grandmother having died from cancerous disease. She had come expecting to have the tumor immediately removed. But when I explained to her that a removal of her breast would neither change the quality of her blood, the properties of her tissues, nor the hereditary family tendency, and that unless these could be first changed, the local development of cancerous tissue would be very certain to follow within a few months, she readily consented to postpone the operation for a preparatory treatment of two months. She adhered strictly to a milk and vegetable diet, spent much time in the open air, and took one of the following pills after each meal-time.

℞	Sodii Arseniatis	0.250 grams	gr. iv
	Extracti Conii	4.000 "	ʒi

Mix, divide into sixty pills.

At the end of the two months she returned, in apparent good health, having had no twinges of pain in the tumor during the last three or four weeks, and so far as could be judged by careful measurement, no increase in the size of the tumor. I now removed the entire breast, by the usual

operation, leaving enough of the integument to enable me to close up the wound by sutures. The part was covered with simple dressings without antiseptics in any form. The same diet and medicines were continued as before the operation. The wound healed rapidly, cicatrization being complete in three weeks, when she returned to her home, where she could enjoy good air and all the comforts of life. She continued under my direction, however, through correspondence with her husband, for two years. During all the first year she continued to take the pills of arseniate of sodium and extract of conium; omitting them only three times, for four or five days at a time. During the second year she omitted the pills every third month, and subsequently omitted them entirely. At no time, however, did she return to the use of meat as an article of diet. At the end of three years and six months, she visited me in good health; and at two subsequent times when visiting this city she called at my office; the last time about thirteen years after the extirpation of the breast. She was still in good health, and a careful examination could detect no appearance of cancerous development in any part of the system. She was enjoying her milk and vegetable diet as usual, with no apparent disposition to abandon it. Since that time I have neither seen nor heard from her. I am satisfied that the same management, executed with the same faithfulness and perseverance, would result in the permanent cure of a very large proportion of all the cases of scirrhus or hard cancers, so located that they could be extirpated at the proper time. And even in the cases where the cancerous growth cannot be extirpated, its progress may be greatly retarded and the life of the patient much prolonged. In proof of this, I could cite several cases of well marked cancer of the uterus and its appendages. In cancer located in any part of the stomach or œsophagus, I have found a milk diet, and the use of the following formula to afford more relief than I could obtain in any other way.

℞			
	Acidi Carbolici	0.50 grams	gr. viii
	Glycerinæ	15.00 c. c.	ʒiv
	Tincturæ Gelsemini	15.00 "	ʒiv
	Tincturæ Opii Camphoratæ	60.00 "	ʒii
	Aquæ	60.00 "	ʒii

Mix. Give four cubic centimeters (fl. ʒi), just before each regular meal time, and at bed time. In the early stage of the disease, I have sometimes added two minims of the liquor potassii arsenici (Fowler's solution) to each dose, with apparent benefit. Dr. Bartholow decidedly recommends, in the same class of cases, small doses of an equal mixture of pure carbolic acid and iodine.* In the more rapidly developed encephaloid growths in the liver, kidneys, structures of the eye, etc., I have seen but little influence exerted by diet or medicine, and in no instance have I known a case of that variety to be permanently relieved by surgical operations. In the present state of our knowledge, the services of either physician or surgeon are limited, in such cases, to the judicious use of such diet, and anodyne medicines as will best palliate the suffering of the patient, and thereby render the brief period he has to live as comfortable as possible.

For further details in regard to the local development of cancerous diseases, and the surgical procedures for their relief, including the very recent operations for extirpation of cancers of the stomach and intestines, I must refer you to the more recent valuable works on surgery.

*See Practice of Medicine, by Roberts Bartholow, M. D., etc., etc., p. 48.

CONSTITUTIONAL SYPHILIS.

Syphilis in all its forms and stages, is so fully presented to the profession, both in special treatises and in general works on surgery, in addition to being in special courses of instruction in the medical schools, that I might be justified in omitting all allusion to the subject in the present course. Yet there are two or three conclusions to which I have been forced by my own clinical observations, that I deem of sufficient importance to occupy your attention during the remainder of the present hour. Syphilis in all its forms is the result of the action of a specific virus generally introduced into the human system by inoculation. Such inoculation usually takes place during impure sexual connection, but may be the result of accident, as when introduced into wounds on the fingers while dressing syphilitic sores, washing clothing impregnated with the virus; or in any other way bringing the matter in contact with an abraded or sensitive surface.

The first effect of inoculation is the formation of a sore at the point of contact, from which, if not speedily destroyed, the poison is carried by the lymphatics to the nearest lymphatic glands, causing them to become inflamed and swollen. The sore at the place of inoculation and the inflammation of the adjacent glands constitute what is called primary syphilis. Whatever subsequent manifestations of disease occur, are the result of the introduction of the poison into the blood, and are called constitutional. Most writers divide the latter into secondary and tertiary forms of disease; but the distinction is for the most part arbitrary and without practical utility. The primary sores differ somewhat in different cases. In some, the sore is small with smooth edges and a hard base, and is called the hard or true Hunterian chancre. In others, it is larger in circumference, without hardness at its base, and with rather irregular excavated edges, and is called the soft chancre or chancroid.

In still other cases more rarely met with, the sore is large, irregular, rapidly spreading, and accompanied by much tumefaction of the surrounding areolar tissue, and is called the phagedenic chancre. The first of these sores does not generally appear until from five to fifteen days after the inoculation, spreads but little, and generally soon heals up. But the poison from it is very liable to reach the neighboring lymphatic glands, causing them to become swollen, tender, and hard, and remain so for two or three weeks, and then undergo resolution without suppurating. But their disappearance is almost always followed, in due time, by some form of constitutional disease.

The second variety appears within from one to five days after inoculation or contact with the poison, soon extends its poison to the lymphatic glands, causing more active inflammation, swelling and pain, and very generally ends in suppuration, forming abscesses, which are often slow to heal, but which are not so constantly followed by constitutional or secondary manifestations. Indeed, many of the modern specialists in this department, claim that the soft chancre originates from a specifically different poison from that which produces the hard variety, and is never followed by constitutional infection. The phagedenic chancre is only a severe form of the soft variety, accompanied by more diffuse inflammation, suppuration, and sometimes even extensive sloughing.

Now, gentlemen, while I freely admit the accuracy of the descriptions of all these varieties of primary syphilitic sores, and their relative tendencies to infect the neighboring glands, and at a later period to induce a succes-

sion of constitutional symptoms, one of the important conclusions I wish to give you is, that it is entirely unsafe to rely upon the doctrine that any one of these syphilitic sores, whether it be chancre or chancroid, will not be followed by constitutional symptoms at some subsequent period of time.

In other words, if a patient comes to you with the most perfect specimen of a soft chancre, and it is speedily followed by abundantly suppurating buboes or lymphatic glands, you cannot safely promise him that there will positively be no subsequent constitutional or secondary symptoms resulting from the infection. For I have repeatedly seen almost every variety of secondary and tertiary manifestation, in patients whose primary sores were entirely free from induration, and whose groins were well scared from the original suppurated glands.

Another conclusion based on direct clinical observation, is that you can never rely upon destroying a primary syphilitic sore so early and completely as to certainly prevent the poison from entering the blood and inducing constitutional effects.

That true chancres are sometimes thus completely destroyed and never followed by any secondary effects I freely admit. But in other cases when the primary point of inoculation has been attacked equally early, and to all appearance with equal effect, the subsequent history has shown abundant evidences of constitutional infection. There is, therefore, no reliable index by which we may know whether any given patient is safe from future trouble, until the lapse of time demonstrates it.

The principal secondary or constitutional manifestations of syphilitic disease are cutaneous eruptions; specific inflammations and ulcerations of the mucous membrane of the fauces, nostrils and mouth; inflammation of the periosteum, especially that covering the bones of the nose and palate, the long bones of the extremities, and those of the cranium; and structural degeneration, usually called syphiloma, in the parenchyma of internal organs, more especially the liver, kidneys, lungs and brain with its appendages. For full descriptions of all these I must refer you to the lectures on surgery and dermatology, or to special works on syphilitic diseases. I will only state that they are all the effects of a specific virus, primarily introduced into the system from without, and may vary much, both in the order of their manifestation, and in the length of time from the primary introduction.

Long intervals may occur, even amounting to ten or twenty years, during which patients once having had syphilis, may appear perfectly well, and yet become sorely afflicted with periosteal nodes or syphiloma of the nervous centers, etc. Consequently you can never assume to know certainly, whether in any given case, the patient is perfectly and permanently cured or not.

Clinical facts also show that a wife may contract constitutional syphilis from the bearing of children congenitally affected with the disease from the father. This, with the preceding statement, will remind you that physicians are liable to meet with secondary or remote manifestations of the disease at times, and in families where they least expect them. It is not rare that a young married woman, belonging to a domestic circle that no one would suspect, after one or more abortions or premature deliveries, begins herself to fail in health, and soon presents unmistakable symptoms of some form of constitutional syphilis. Or the child may be born at full term, and in a few days its skin is found speckled with copper colored spots, or its mouth and nostrils occupied with the characteristic erythema. On the other hand I have seen both men and women, in the advanced period of

life, after having reared families of apparently healthy children, and lived as exemplary and leading members of society for twenty-five or thirty years, become seriously afflicted with cephalalgia, derangements of vision, unsteadiness of gait, in one instance hemiplegia, and in another epilepsy, in which a careful examination showed well marked pericranial nodes and corresponding thickening of the dura-mater, with pressure upon the cerebral surface; and all of which were relieved by well directed anti-syphilitic treatment. In one lady, at least fifty years of age, and mother of a family of grown-up children, the functions of the brain became so seriously disturbed that her attending physician, who from the circumstances of the family, had not so much as thought of a possible syphilitic influence, was very confident that she had effusion into the lateral ventricles of the brain. Seeing the patient in consultation, and passing my hand over the forehead and top of the head to note the temperature, I discovered two well developed nodes over the upper part of the frontal and one over the parietal bones.

After retiring to a private room for consultation, I asked the family physican if he knew anything in regard to syphilitic diseases in the early life of either the patient or her husband, and whether it was not possible that the present condition of his patient resulted from slow alterations of the structures inside of the cranium corresponding with the thickenings of the pericranial membrane visible externally. But finding him quite inclined to resent even the suggestion, and not wishing to have the family disturbed by any questions which might raise unpleasant suspicions I dropped the subject, and without further questioning of his diagnosis, easily pursuaded him to put his patient upon the use of a prescription containing iodide of sodium, bichloride of mercury and conium; claiming that its alterative action would be more likely to induce absorption of the supposed serous effusion than any other remedies I could suggest. The result was, that in a few days the patient began perceptibly to improve, which encouraged a continuance of the medicine; and under its influence, in three months, all her cerebral symptoms as well as the nodes on the cranium had disappeared, and the patient was able to ride out and resume some charge of her household. It will be well for you to be ever on the alert for these remote and troublesome syphilitic affections, but when you meet them in families, affecting innocent parties, sometimes from hereditary influence, other times, as I have already intimated, from a husband either directly, or indirectly through placental connection with a diseased fœtus, it is not necessary to create domestic discord and destroy the happiness of a whole life, by such inquiries as will at once suggest the real nature of the case. On the contrary, simply explain to the wife or mother that there is some chronic derangement of the nutritive processes, which will need careful treatment for some time, and proceed at once with the most reliable remedies for what you suppose to be the real disease.

If the nature of the case is such as to indicate that the constitutional condition of the husband is still impure, inform him privately of his condition, and insist that he shall faithfully use the necessary means for correcting his own morbid condition. By such a course, the judicious and skillful physician can obviate an immense amount of moral, social, and physical evil, during his professional career. My views of the treatment of syphilis may be briefly stated in the following propositions:

First. If I meet a primary sore, during the first three days after it becomer visible I immediately cauterize it freely either with strong nitric acid or liquid carbolic acid, with the hope of destroying all the virus before it has left the sore, or entered either the lymphatics or the blood. Subsequently

I have it dressed morning and evening with carbolated cosmoline or iodoform until it is healed. If the sore or chancre is more than three days old, the cauterization may as well be omitted, and the iodoform or carbolated dressing applied from the beginning; for there is little or no probability that absorption of the virus can be prevented, and there is generally no difficulty in healing the sore.

Second. As there is no absolute certainty that absorption of the virus will be prevented in any given case, I am in the habit of commencing at once, in all cases, the internal administration of mercury, or the preparations of iodine, or both, as the most reliable means for neutralizing or expelling so much of the poison as may have been taken up. If the patient is young and vigorous, I give one of the following pills three or four times a day:

℞	Hydrargyri Chloridi Mitis	1.5 grams	gr. xxiv
	Extracti Conii	1.5 "	gr. xxiv

Mix, divide into xx pills.

If the patient is already anæmic or debilitated, I prefer giving four cubic centimeters (fl ʒi) of the following formula, before each meal and at bed time:

℞	Hydrargyri Chloridi Coros.	0.1 gram	gr. iss
	Extracti Conii Fluidi	15.0 c. c	ʒiv
	Tincturæ Cinchonæ Comp.	160.0 c. c.	ʒv

Mix. Put each dose with sweetened water when given. If the bowels do not move regularly each day I prompt them by the mildest class of laxatives, and confine the patient to a mild plain diet, without any alcoholic drinks either fermented or distilled. If the gums and teeth do not become tender to pressure, and no swellings appear in the groins or neighboring lymphatic glands, I allow one or the other of these prescriptions to be continued until the primary sore is entirely healed, and then discontinue them on the presumption that none of the specific poison had been absorbed, and further treatment is unnecessary.

Third. If, however, in spite of the foregoing treatment, or from the delay of the patient before presenting himself, the lymphatic glands have become inflamed and swollen, whether they present any appearance of suppurating or not, I commence directly the administration of the iodide of sodium, bichloride of mercury, and conium, in accordance with the following formula:

℞	Hydrargyri Chloridi Coros.	0.10 grams	gr. iss
	Sodii Iodidi	15.00 "	ʒiv
	Extracti ConiiFluidi	15.00 c. c.	ʒiv
	Elixer Simplicis	145.000 " "	ʒivss.

Mix. Give four cubic centimeters (fl. ʒi) in a little additional water before each meal time and at bed time.

If the swollen glands are very tender and present indications of commencing suppuration, I apply emolient poultices until the abscesses are sufficiently matured, and then open them freely, deeming it important to give the pus an early and free outlet. They are then washed out and dressed with antiseptic applications morning and evening until they become healed. If the affected glands are not large or tender and give no indication of

suppurating. I dress them with mercurial ointment or a liniment of two parts of camphorated soap liniment and one of tincture of iodine, until they disappear. If the affection of the glands disappears either by resolution, or by suppuration and subsequent cicatrization, I continue the administration of the iodide and mercurial each morning and evening for three or four weeks, when, if no secondary symptoms appear, all medicines are discontinued. But the patient is warned to immediately apply for further treatment, should constitutional symptoms of any kind make their appearance.

Fourth. For all the forms of constitutional syphilitic disease, whether in the skin, the membranes of the mouth, fauces and nostrils; the periosteum, bones, or parenchyma of internal organs; I have found the combination of iodide of sodium, bichloride of mercury and conium, to come nearer to a reliable specific, than any or all other remedies that have been suggested. For many cases, the formula I gave you a few minutes since, is the best; but if the patient is already more or less debilitated, it is better to substitute the compound tincture of cinchona in the place of the simple elixer. I generally commence giving four cubic centimeters (fl ʒi) in a tablespoonful of sweetened water four times per day, for adults, and proportionately less for children. I allow a diet, embracing a fair variety of good plain food, but prefer the entire avoidance of alcoholic drinks and tobacco. In old anæmic cases, and in generally depraved conditions of the system, I give in addition to the alteratives and good food, such additional tonics and nutrients as extract of malt and cod-liver oil; citrate of iron and quinine; or iron, quinine and strychnia; giving them usually after meals. I do not remember ever meeting a case, in which the iodide of sodium and bichloride of mercury, given as I have suggested, did not relieve the pains of syphilitic nodes in four or five days, with a subsequent reduction of the swelling. Neither have I ever met with syphilitic ulcerations in the nostrils, mouth, or elsewhere, that did not heal under their influence, unless hindered by the presence of decayed bone. You may be ready to ask why not give the biniodide of mercury ready formed, as the iodide of sodium and bichloride are supposed to form the biniodide when combined in solution. I answer, that if the combination is formed, there is left an efficient excess of the iodide of sodium in the formula, and that an abundant clinical experience has shown the two to be much more efficient than either one of the salts of iodine or mercury are alone. The combination given in the formula can be taken, by the great majority of patients, longer without affecting the gums or mouth, than either the proto or the biniodide of mercury, and with less impairment of the digestive and nutritive functions than the large doses of the iodide of potassium, which are so generally recommended. Like all other active drugs, however, its effects should be carefully noted in each case, and the mercurial part of the prescription omitted whenever the gums or the breath show the mercurial impression; but may be cautiously resumed when these symptoms have disappeared. Strict attention should be given to hygienic and sanitary regulations; and patients should not be allowed to continue a perpetual use of drugs, when there are no real appearances of disease, merely because they fear some form of trouble may come. With these brief and somewhat dogmatic statements I must leave the subject.

LECTURE XXXI.

Rheumatism—Its Varieties, Causes, Symptoms, Diagnosis, Special Pathology, Treatment, and Prophylaxis.

GENTLEMEN: I shall occupy your attention during the present hour with the consideration of one of the most common and most troublesome diseases that you will encounter in the field of general practice. I allude to rheumatism, which in its general application, includes a considerable variety of painful and tedious affections. When cases present active general fever, associated with the local inflammation and swelling, they are called acute rheumatism or rheumatic fever. When they present considerable local inflammation and swelling with but little general fever, they are often classed as sub-acute rheumatism. Cases presenting local pains, stiffness, and impairments of motion, persisting through considerable periods of time, but without fever, are called chronic. Cases are also, by many, grouped and named from the structures prominently involved; as, myalgia, when located in the muscles; neuralgic rheumatism, when affecting the nerves or their sheaths; and other cases are named from the disease with which they may be associated, as syphilitic, gonorrhœal, and gouty. This variety of grouping of cases and application of names, does not indicate any specific differences in the nature of the rheumatic affections, but simply differences in activity, location, or coincident morbid conditions. For accuracy of description and certainty of diagnosis, it is quite sufficient to arrange all cases in one or the other of two classes called acute and chronic rheumatism.

Etiology.—The causes of rheumatism, in all its grades and forms, must be divided into predisposing and exciting. The first embrace all those influences that are capable of increasing the excitability of the tissues on the one hand, and of retarding the cutaneous eliminations on the other.

The most important of these are habitual exposure to frequent and severe atmospheric changes coupled with dampness, and protracted mental or physical labor. The influence of these causes in favoring the accumulation of an excess of lactic acid and lactates in the blood and secretions, and the localities in our country where they are most active, I explained sufficiently in a preceding lecture while commenting on the general etiology and pathology of the class of constitutional diseases.* Under the same head must be placed hereditary influences which were also explained in the preceding lecture. The chief exciting or direct cause of the local phenomena of rheumatism is an excess of such acid material in the system as is capable of inducing a specific grade of inflammation in some one or more of the fibrous tissues of the body. I say acid material, because in all the more acute forms of the disease, the blood and the several secretions have almost uniformly been found to contain more than the natural evidences of acidity, and the efficient neutralization of this by remedies has generally afforded relief. While careful and extensive analytical investigations by different parties, have not shown conclusively the particular acid or acids present in excess, they have rendered it highly probable that it is chiefly lactic acid and its salts. Whatever may be the particular materies morbi that constitutes the direct active agent in the production of rheumatic inflammation, its impression on the living tissues once made, leaves them ever afterward more susceptible to its influence than before.

* See pages 252-3-4 of this work.

This susceptibility is not merely local, thereby determining each new attack of inflammation to appear in the same articulations, but is so general that each successive outbreak is as likely to invade new structures or places as the old ones. This fact alone proves the constitutional or general character of the disease. Statistics show that all the forms of rheumatism are most prevalent between the ages of fifteen and thirty years, yet they are sometimes met with at all periods from the first to the last year of human life. The acute and subacute grades are most prevalent in youth and the early part of adult life, while the chronic forms are more frequently associated with old age. The disease attacks a larger proportion of males than females; and is more prevalent among those engaged in physical labor than other classes, which is doubtless owing to their greater degree of exposure to the predisposing causes of the disease.

Clinical History or Symptoms of Acute Articular Rheumatism.—The acute form of rheumatism, or rheumatic fever, varies much in its severity, rapidity of progress, and duration. The great majority of cases of average severity commence suddenly or with but little premonitory warning. The patient often retires at night with only a little stiffness or slight feeling of soreness in his back. In some cases, this is so slight as to escape the patient's notice; while in others it is quite marked, either in the back or in some of the articulations. But he usually awakes before midnight with a severe aching or gnawing pain in some part of the spine, or wherever the stiffness had been felt the previous evening. In attempting to change his position, he finds the pain greatly increased by every movement. Feeling feverish, restless and unable to leave his bed without intense suffering, he sends for his physican in the morning. The doctor, on his arrival, finds his patient with some redness or flush of the face; heat and dryness of the skin; a full and frequent pulse, generally between 90 and 100 per minute; tongue covered with a thin white coat; urine scanty and high colored; bowels inactive; temperature in the axilla from 38.3° to 39°C (101° to 102.5° F.); with great restlessness from constant pains aggravated by motion. In other words he finds his patient presenting all the symptoms of an active irritative fever, to which are added the severe and constant local pains coupled with restlessness and yet inability to move without great increase of suffering, which is characteristic of acute rheumatism. In the most acute and severe form of the disease, the pain generally attacks the whole length of the spine at once, and in twenty-four hours it extends to the shoulders and hips; the next day it includes the elbows and knees, and by the end of the third or fourth day, it will have extended to the wrists, ankles, and small joints of the fingers and toes, thereby involving almost every articulation in the body and extremities. All the articulations attacked quickly become swollen, excessively tender to the touch, with constant aching pain much increased by the slightest motion. The swelling is generally diffused more or less over the whole joint, but is most prominent over the course of the ligaments, diminishes gradually in both directions from the articular junctions, having no abrupt margins or terminations, and presenting little or no redness on the surface. In the later stage of severe cases, the areolar tissue in the vicinity of the inflamed parts is often found infiltrated with serum so as to pit more or less from pressure; and in some, the synovial membrane is sufficiently involved to cause serous effusion into the sac, which will make the most prominent part of the swelling between the ligaments crossing the joint, where there is the least resistance to the distension of the membrane. In the very severe cases I have been describing the disease generally reaches its acme, or highest stage of activity during the fourth or fifth days; when

the temperature is between 40° and 41° C. (104° and 106° F.); the pulse full, and varying in frequency from 100 to 120 per minute; general scantiness of secretion, especially of the urine, which is redder than natural and strongly acid in reaction with litmus, and the patient tortured with gnawing pains throughout the trunk and extremities, yet utterly helpless from the increase of pain on every attempt to move. Having arrived at this stage of development, the natural tendency of the disease, when unmodified by treatment, is to remain nearly stationary for three or four days, or until about the middle of the second week from the commencement of the attack. Of course during these days the loss of appetite, continued suffering, and want of sleep, cause correspondingly increased weakness, with increased frequency and diminished force of the pulse; and sometimes, more especially during the night, some degree of delirium. During the last half of the second and the first half of the third weeks, the constant hard aching pains gradually disappear, leaving only soreness and pain on motion, with some swelling; the temperature gradually declines; the pulse becomes slower; the urine more abundant and often deposits on standing in the vessel, a red sediment; the skin becomes moist, and the patient takes short intervals of quiet sleep. These changes are pretty sure indications of a more rapid decline in all the general and local symptoms during the last half of the third week, and the establishment of convalescence as the patient enters the fourth week of his confinement. In some few instances there has occurred during the last half of the second week a more copious discharge of urine, containing a large excess of saline and excretory constituents, with moderate spontaneous looseness of the bowels and moisture of the skin, followed by a rapid decline in all the general and local symptoms of disease, and an early establishment of convalescence. On the other hand, a larger number of cases are met with, in which, after the middle of the second week the temperature remains high; the urine scanty, and though the skin becomes moist, the perspiration, even when quite free, has a sour disagreeable odor; the pulse becomes weaker and more frequent; the skin on the neck, upper part of the chest and axilla, covered with sudamina; and by the end of the third week the wrists, back of the hands and feet are more or less œdematous, and the patient feels a great sense of exhaustion. Such cases usually prove very tedious, the full convalescence being postponed until the end of the fourth, fifth or even sixth week. And even then, in some cases, one or more of the articulations remain swollen, stiff, and sore for an indefinite period, the local inflammation having assumed a chronic form.

It is not often that acute rheumatic inflammation attacks internal organs or structures, except the heart and its appendages.

Inflammation of the interior lining of the left cavities of the heart and of the aorta, constituting rheumatic endocarditis, supervenes during the progress of a considerable percentage of the cases of acute rheumatism. Inflammation of the pericardium is next in the order of frequency; while acute rheumatic inflammation of the membranes of the brain, the fibrous structure of the lungs, and the muscular coat of the stomach and intestines occurs very rarely.

The fact that endocardial and pericardial inflammations frequently supervene as complications of acute rheumatic fever, should cause you to make direct examination of the condition of those organs every day during your attendance upon this class of patients. They may supervene at any stage of the general disease, but in the large majority of cases their presence is first manifested during the second week of its progress. Their presence is readily detected by the more excited and fuller pulse; pain

and oppression in the cardiac region, and especially by the characteristic bellows murmur from the endocardium, and friction sounds from the pericardium. The occurrence of either or both of these complications during the progress of a case of rheumatism, adds much to its gravity, and generally increases much the duration of the patient's sickness, though seldom causing a directly fatal result.

From the description I have given you of the more active grades of acute rheumatism you will infer that the disease, though varying much in its severity and duration, generally tends toward recovery in from two to six weeks.

Subacute Rheumatism.—In a large proportion of the rheumatic attacks met with in general practice, the symptoms commence less abruptly and the febrile phenomena are much less severe throughout their course. After feeling some stiffness and soreness, either in the upper part of the dorsal or in the lumbar part of the spine for one, two or three days, the patient finds it difficult to get out of bed on account of an increase of such stiffness, accompanied by continuous dull pain and a moderate fever.

The local pain usually increases moderately for about three days, when it quickly declines. But simultaneously with such decline, if it had been in the lower part of the back and hips, it commences in the knees and steadily increases with some swelling and tenderness, for three days, when it moves to the ankles, and after about the same length of time, it moves to the smaller joints of the feet and toes. If the attack has commenced in the neck and shoulders, it will tarry the same length of time, presenting the same symptoms, and then move successively to the elbows, wrists, and smaller joints of the hands and fingers. Occasionally a case occurs in which the local inflammation attacks parallel articulations in both upper and lower extremities simultaneously. While in a large majority of the subacute cases the local symptoms commence in some part of the spine and move from one series of articulations to another, in the direction of the feet and hands, I have seen cases in which this order was reversed, the smaller joints being attacked first, and the larger ones in successive order until the spinal column was reached. In a large majority of cases the local inflammation moves bilaterally; that is, it attacks corresponding articulations on both sides at the same time. This is not always the case, however, for I have seen many of the milder grade, in which the disease attacked in succession all the joints of one arm or one leg, and then those of the other. But it is exceeding rare that true rheumatic inflammation limits its attack to a single articulation, either in the trunk of the body or extremities.

It is generally the subacute grade of rheumatism that sometimes attacks the muscles or the fascia surrounding them, and their tendinous attachments, technically called myalgia.

The muscular structures most frequently involved are those of the loins, shoulders, diaphragm, intercostals, and the muscular coat of the intestines. It is the same grade of the disease that so frequently involves the spinal nerves at their exit from the spinal column, particularly the roots of the sciatic and the intercostals, causing severe neuralgic pains throughout the whole distribution of those nerves. It is also the subacute form of rheumatism that is apt to attack patients suffering from gonorrhœa, and it is then called gonorrhœal rheumatism.

In this connection it is limited to no class of structures, but is most frequently met with in the wrists and ankles and the smaller joints of the extremities, where it often persists for a long time, and in some cases permanently impairs the usefulness of the parts either by inducing adhesions of the tendons to their sheaths, causing a form of false anchylosis, or by

such a degree of softening of the ligaments and fibrous structures, as make the joints loose, flabby, and too weak for use. As rheumatic gout is a mingling of some of the phenomena of both gout and rheumatism, I shall defer any special description of it until the phenomena of gout have been under consideration.

Chronic Rheumatism.—Chronic rheumatism may be a sequel of the acute or subacute varieties or it may originate in a chronic form without having been preceded by any more active stage. When it follows a more acute attack, some of the articulations that were primarily affected, remain more or less stiff, and the ligaments sufficiently thickened to make the parts appear slightly swollen. The stiffness and soreness is most marked on first rising in the morning, or in commencing motion after a period of rest, but diminishes while the exercise is continued, so that many who are hardly able to dress themselves in the morning, after getting started, do a fair day's work every day. They are exceedingly sensitive to atmospheric changes, being generally comfortable during warm and dry weather, but suffering much increase of lameness and pain, especially during the night, with every recurrence of cold and damp. They are also very liable to a renewal of more acute attacks, especially during the variable weather of spring and autumn. Cases of rheumatism that are chronic, *ab initio*, are chiefly met with among the laboring classes of both sexes. Washing and scrubbing women, and those men who are engaged in such manual labor as exposes them much to cold and wet, furnish a large portion of all the cases of strictly chronic rheumatism. The disease may commence in the muscular and ligamentous structures in any part of the body or extremities, but is much the most frequent in the lower part of the back and hips, in the shoulders, in the wrists and smaller joints of the hands, and in the ankles. It usually commences with dull aching pains during the night, followed by some sense of stiffness and soreness in the morning, which mostly disappears after a little exercise, but returns in the same manner when night comes. At first the symptoms continue only a few days at a time, which is generally during wet and cold weather, or after unusually severe exercise, and disappear while it is mild and dry. Each succeeding year, however, the periods of suffering become more protracted and severe; and the patient finally becomes a more delicate indicator of the electric and hygrometric conditions of the atmosphere than any instruments hitherto devised. The ligaments and fibrous structure of the articulations most affected, become gradually thickened or hypertophied and hardened, causing the joints to appear enlarged as well as stiff, and much of the time, painful.

This is particularly true concerning the wrists and the smaller joints of the hands and fingers, which sometimes become so stiff that they can be neither fully flexed nor extended, and consequently their usefulness is very much impaired. And yet, most of these patients are exempt from all general febrile symptoms, retaining a fair appetite, a good degree of nutrition, and a general feeling of health.

Sometimes they are troubled with constipation, sour eructations, acid urine, and some degree of general muscular atrophy. The latter, by shortening the muscles, causes more flexure of the joints and more deformity of the extremities. I have seen several old cases of this kind, in which the patients could neither get a hand to their heads, feed themselves, nor walk. Purely chronic rheumatism seldom invades the internal organs and structures of the body, and consequently manifests but little tendency to shorten the duration of life. If there are any exceptions to this rule, they relate chiefly to the fibrous tissues of the bronchial tubes, the uterus, and the bladder.

I have long been satisfied that many of the habitually recurring cases of chronic capillary bronchitis, and of a similar grade of morbid action in the connective tissue of the lungs leading to what has, by some, been called fibroid phthisis, are strictly rheumatic in their nature. The same is true of the fibrous structure of the uterus in many of the cases of dysmenorrhœa and habitual aching in the back and hips; and of the bladder in some of the cases called cystitis and irritable bladder. But the special features of all such cases are more conveniently considered in connection with the local affections of those organs.

Diagnosis.—The symptoms and progress of acute and subacute rheumatism are, in several respects, so peculiar as to leave very little liability to error in regard to diagnosis. The movable or migratory character of the local inflammation, the involvement of corresponding articulations on each side at the same time, the absence of all tendency to suppuration, and the character of the accompanying fever, are sufficient to distinguish all ordinary cases from other affections. The diseases most likely to be confounded with rheumatism, are acute and chronic synovitis, periostitis, gout, and some cases of pyæmia. If you remember that the two first are fixed, not movable from one part to another, and generally accompanied by some degree of serous effusion into the synovial sac, that periostitis commences on the shaft of the bones between the articular extremities, and that both gout and pyæmia have characteristic antecedent histories, you will readily avoid mistaking either of these for any grade of rheumatism. There is more danger of mistaking rheumatic inflammation of the diaphragm and intercostal muscles for pleurisy or hepatitis, or that of the muscular coat of the intestines for peritonitis. The more dull and continuous character of the pain, and the absence of either pleuritic friction or diminished resonance above the diaphragm, and equally, absence of the physical signs of enlargement of either liver or spleen below, will remove all doubts in regard to rheumatism in the lower part of the chest and diaphragm. While in the abdomen, the co-existence of dull pain, much increased by peristaltic motion of the bowels, only moderate tenderness to pressure, moderate general fever, constipation, scantiness and increased acidity of the urine, and the persistence of these from day to day with but little distension of the abdomen, and no effusion into the peritoneal sac, differs so much from the more acute pain, quicker pulse, higher temperature, greater tenderness and earlier abdominal distension of peritonitis, that the one should not be mistaken for the other by any of you.

The diagnosis between chronic rheumatism and neuralgia rests mainly on the fact that the pain in the first is dull and aching, and located chiefly in the muscular and ligamentous structures; while that of neuralgia is sharp, intermitting, and located in the course of some one or more nerves. The first is most stiff and painful at the beginning of motion, and often disappears during its continuance, while the latter is either unaffected by motion, or it increases with the continuance of the movements in the part which is the seat of pain.

Prognosis.—The prognosis in all forms and stages of rheumatism is favorable, so far as relates to the continuance of life. In some of the most acute attacks, unmodified by treatment, the long continuance of extreme pyrexia, or very high temperature, causes great prostration, and doubtless in some rare instances, terminates fatally, without the extension of the local inflammation to important internal organs. But no such case has come directly under my own observation. When the attacks become complicated with acute rheumatic inflammation of the cerebral, pulmonary, or cardiac structures, there is more danger, and fatal results are much more frequent.

Yet, far the larger proportion even of these complicated cases recover from the acute stage of the disease, but with thickened and hardened cardiac valves, pericardial adhesions or sclerosis of the connective tissue of the lungs, which, in the remote changes they induce, ultimately lead to a material shortening of the period of life.

Special Pathology, and Pathological Anatomy.—In the lecture on the general pathology of the class of constitutional diseases, I stated that the essential pathology of rheumatism consisted in an increase or exaltation of the elementary properties of the tissues; an increase of the plasticity of the blood, resulting from the accumulation of certain acid products (probably lactates) in the system; with a strong tendency to develop local sthenic or plastic inflammation in the fibrous structures of the body and extremities. That these views are correct, both in regard to the general rheumatic diathesis and the special characters of the local inflammations accompanying it, is rendered more evident by the nature of the structural changes that are found to have taken place in the inflamed tissues. There is literally no tendency in rheumatic inflammation to purulent degeneration of the exudative material or to the establishment of the suppurative process. On the contrary the exudative material rapidly acquires a low grade of organization, increasing the bulk and density of the inflamed structures, and in many instances becomes so fully identified with the natural structure as to disintegrate and disappear very slowly after convalescence; and in some cases, even remaining permanent, as in the thickened and indurated cardiac valves, the hypertrophied ligaments over the affected articulations, and the firm adhesions in the pericardium, sheaths of the tendons, synovial membranes, etc. In no other form of disease do we find inflammation presenting a character so persistently plastic as in rheumatism.

Aside from the evidences of increased acidity in the blood and secretions, the most notable changes in the first named fluid are the great increase of fibrin, and moderate decrease in the red corpuscles, albumen, and soluble salts. These changes are most notable in the more severe grades of the acute form of rheumatism, while in the subacute and chronic forms they are very slight.

Treatment.—In the treatment of acute rheumatic fever and inflammation, the practitioner has four distinct indications to be fulfilled, or well defined purposes to be accomplished.

1st. To neutralize the excess of acidity which is supposed to constitute the immediate cause of the febrile and inflammatory actions.

2nd. To promote the eliminations, more especially from the skin and kidneys for the purpose of preventing further accumulation, in the system, of the same offending material.

3rd. To alleviate the suffering of the patient by such sedative and anodyne remedies as will lessen the morbid excitement in the nervous and vascular structures.

4th. To so far lessen the plasticity of the exudative material that it will undergo early disintegration and removal from the tissues; thereby preventing those hypertrophies and indurations which are so prone to result in permanent cardiac changes, and such stiffness as to permanently impair the usefulness of many of the articulations.

The first and second of these indications are founded on the idea that the disease depends upon the presence of a material cause, and have for their object its destruction or removal, so far, at least, as to suspend its further influence in the system.

The third and fourth relate to the modification or removal of the morbid

processes already established. The means for fulfilling these several indications may be numerous and varied in their nature; but the indications themselves, being founded upon the assumption of an efficient cause and the nature of the morbid actions it induces, will always remain the same.

Although each of the indications named presents a well defined purpose which should be clearly comprehended by the practitioner, yet, as often happens in the treatment of acute diseases, especially in the early stage, the same remedies that efficiently fulfill the indications for the removal of the exciting cause or causes, also fulfill, at the same time, all the others.

That is, an early removal of the efficient cause, is directly followed by a disappearance of its effects. This is not always the case, however; for when inflammatory action has continued until more or less exudation has taken place, and the blood has become impregnated with an excess of fibrin and other products of tissue changes, it will often continue through its remaining stages after the further action of the exciting cause has entirely ceased. In acute and subacute rheumatism the first object is to impregnate the blood and tissues with such quantity of alkaline salts as will fully neutralize the excess of acid material, and render the urinary secretion either neutral or alkaline in its reaction. For this purpose alone we have no better remedies than the carbonates and bicarbonates of sodium and potassium, given dissolved in water, in as large and frequently repeated doses as the stomach will tolerate until the desired saturation is obtained. From one to three grams (gr. xv to gr. xlv) given every one or two hours will generally produce the desired effect in neutralizing the acidity in from one to three days; after which the same doses may be continued at longer intervals. This same saturation of the blood with alkaline salts, constitutes one of the most efficient means for lessening the plasticity of the exudation taking place in the inflamed structures; and consequently helps to fulfill the fourth indication that I named to you. To promote the action of the skin, kidneys, and glandular structures generally, and at the same time lessen the suffering of the patient, it was formerly the practice to give a combination of the compound powder of ipecacuanha and opium with nitrate of potassium and small doses of calomel, every four or six hours until the intensity of the disease abated. During the last few years it has been ascertained, both by experiments on animals and by abundant clinical observation, that the salicylic acid, in efficient doses, produces a strong sedative effect on the sensory and excito-motory nervous system and lessens the temperature as an antipyretic. These properties give it the power to speedily relieve the intense suffering and high temperature of acute articular rheumatism; and when combined with a carbonate or bicarbonate of sodium, its administration fulfills all the indications presented in the early stage of the more acute and severe grades of rheumatic disease. You may combine it with the alkaline salt extempore, or better perhaps use the officinal salicylate of sodium, of which from six to ten decigrams (gr. x. to gr xv), may be given, in dilute solution in water, every one or two hours until the pain and fever abate; then double the interval between the doses and continue it until all pain and fever have ceased. I have seen many cases during the last four or five years, both in hospital and private practice, in which the salicylate of sodium thus administered, produced entire relief from pain and fever in from one to three days. Then by lengthening the interval between the doses just sufficient to perpetuate the influence gained for three or four days more, with a laxative when needed, and from three to five decigrams of quinine three times a day, convalescence has been well established, in from five to seven days from the commencement of the attack. It is only in

the acute form of the disease accompanied by an active grade of fever, that I have found the salicylate to act so promptly beneficial. And even in these, if, from neglect or otherwise, the disease has already progressed to the middle or latter part of the second week and presents a small frequent pulse, a skin bathed in a sour perspiration; scanty urine; and a decided sense of weakness, I have found the salicylate too strongly sedative; and have obtained much better results from sub-nitrate of bismuth, bicarbonate of soda, and quinine; the two first, in doses of six decigrams (gr. x) and the last, two decigrams (gr. iii), given every three hours until relief is obtained. At the same time I have derived additional benefit by giving fair doses of the tincture of digitalis to lessen the cardiac irritability and promote the action of the kidneys. It is in this same condition of debility with unhealthy perspiration, that the tincture of chloride of iron has been found beneficial.

If either endocardial or pericardial symptoms supervene in any stage of acute rheumatic attacks, I continue vigorously the same remedies for the general rheumatic disease, as in other cases, but give in addition alterative doses of calomel every four hours until there is a slight mercurial odor in the breath, and such doses of the tincture of veratrum viride as will aid in controlling the excess of cardiac excitement. If effusion takes place into the pericardium, or the endocardial bellows sounds continue after the climax of the fever has passed, a blister over the cardiac region will do much good; and a continuance of fair doses of the iodide of potassium in conjunction with digitalis for a considerable time after the slight mercurial impression has been induced, will add to the probability of preventing any permanent induration or thickening of the cardiac valves, which is a matter of great importance in all these cases.

In the various grades of subacute rheumatism, the several indications for treatment are the same as in the acute, and the remedies to be used substantially the same, but they need not be used with the same degree of activity.

When either the acute or subacute grades of rheumatism prove unusually persistent, and notwithstanding the thorough use of alkaline salts, salicylate sodium, quinine and anodynes with light mercurial alteratives, some of the articulations remain swollen, tender to pressure and motion, with an irritable pulse, restless nights, rather scanty and high-colored urine, though not much fever or elevation of temperature, you may know that the disease is strongly disposed to assume a chronic form. Many such cases will get almost convalescent, and then be renewed moderately, with every noticeable change in the atmospheric conditions. In such cases I have found certain vegetable remedies of much value, more particularly the cimicifuga racemosa, phytolacca decandra, and the senecio aureus. They may be conveniently used either in the form of tincture or fluid extract. I have used them chiefly in the latter form, and in combination with stramonium and some saline diuretic.

The following is a convenient formula:

℞			
	Potassii Acetatis	15. grams	ʒiv
	Extracti Phytolaccæ Dec. Fluidi	60. c. c.	℥ii
	Tincturæ Stramonii	15. "	ʒiv
	Elixer Simplicis	45. "	℥iss

Mix, and give four cubic centimeters (fl ʒi) every six hours, in a little additional water. The cimicifuga or the senecio may be substituted for the phytolacca in the same proportion to the other ingredients. When the case requires a constant prompting of the action of the kidneys, bow-

els and secretory structures generally, I think the phytolacca decandra the most efficient. But if the bowels and secretions are free, and the fibrous tissues, including the cardiac structures, are especially irritable, the cimicifuga or the senecio aureus are preferable.

To get the full beneficial effects of either of these remedies, their use must be continued several weeks. In cases having any of the elements of gout, either hereditary or acquired, I have found much benefit from the administration of colchicum.

The wine of colchicum root may be added in proper proportion to the formula just given, or it may be given separately in doses of one cubic centimeter (min. xv) three or four times per day. In cases involving either syphilitic or gonorrhœal influences, the iodide of potassium may be substituted in the place of the acetate with much advantage.

The successful management of cases of purely chronic rheumatism, is a matter of great difficulty. This is owing in part to the fact that a very large proportion of such cases occur among the laboring classes, and in individuals who can neither afford to separate themselves from further exposure to the predisposing and exciting causes of the disease, nor be induced to adopt such measures, habitually, as would best protect them from the effects of such further exposures. Consequently they generally call for the aid of the physician only when they are suffering some exacerbation of their symptoms, and cease to heed his directions as soon as such special exacerbation has passed. When you are called to prescribe for these chronic cases on account of some fresh increase of the symptoms, I know of no remedies for internal use that will be more likely to relieve them than such as I have just mentioned for cases that are passing from a more acute to the chronic form. If the fresh aggravation of symptoms has been sufficiently severe to make the patient feverish, with coated tongue and dry skin, it will often render relief more certain if in addition to other remedies, you give the first night five or six decigrams (gr. viii or x) of Dover's powder with two decigrams (gr. iii) of calomel, and follow with a saline laxative in the morning. For permanent relief from chronic rheumatism, we must aim to maintain, continuously, a healthy and natural action of all those organs and structures concerned in the work of eliminating the products of tissue changes and other waste and foreign material from the blood. The means for doing this are chiefly hygienic rather than medicinal. To lessen the effects of sudden and severe atmospheric changes, underclothes of flannel or other non-conductors of heat and electricity must be habitually worn next to the skin; damp and uncomfortably cold rooms must be avoided both during the day and the night; both physical and mental exercise should be as uniform as possible, avoiding the extremes of close confinement on the one hand, and of excessive or protracted exercise on the other; the diet should be plain, nutritious, sufficient in quantity and variety to furnish all the elements necessary for healthy nutrition and taken at the regular meal times; and the drinks should be such as do not, either retard molecular changes in the blood and tissues, or lessen important excretory functions. Good water, milk in any form, and weak tea and coffee may be allowed in any quantity the patient may desire. Strong tea and coffee used freely, increases the excitability of the nervous system and lessens the appetite for nutritious food, and had better be avoided. And all forms of alcoholic drinks, whether fermented or distilled, lessen molecular changes and the elimination of excretory material, and consequently favor the accumulation of such material in the blood and tissues. Their effects, therefore, are positively detrimental in the rheumatic as well as in the gouty diathe-

sis. In addition to all these hygienic measures, a warm alkaline bath may be taken once or twice per week, especially in such cases as present an unusually dry skin. From 240 to 360 grams (℥viii to ℥xii) of carbonate of sodium may be put into an ordinary bath tub of comfortably warm water, in which the patient may remain immersed from five to eight minutes.

On rising from the bath the water should be wiped off with towels, and the whole surface briskly but lightly rubbed with dry, soft flannel, which brings a very pleasant glow of electric warmth to the surface, and greatly promotes the healthy function of the skin. The best and safest time for the bath is just before retiring to bed for the night. In some cases of long standing, in which the bowels are habitually costive, and the digestion of food somewhat impaired, I have found the following pills capable of affording much relief from the constipation, and at the same time, of lessening the rheumatic pains and soreness:

℞ Ferri Sulphatis	3.0 grams,	gr. xlv
Extracti Colchici Acetici	1.5 "	" xxii
Extracti Cannabis Indicæ	1.0 "	" xv
Extracti Stramonii	0.6 "	" x
Pulervis Aloes	0.6 "	" x

Mix; divide into xlv pills, of which one may be given before each meal-time until the bowels become regularly moved once a day. Then the one before dinner may be omitted, and generally one week later, another may be omitted, leaving but one pill every night, which often proves sufficient to keep the digestive organs and alimentary canal in a strictly regular and healthy condition, and the patient comparatively comfortable. In another class of cases, you will find not only habitual constipation and flatulency, but also considerable spanæmia or impoverishment of the blood, with cold extremities.

In such, thirteen centigrams (gr. ii) of gum guaiac may be added to each of the pills just mentioned, in the place of the extract of colchicum. I might detail to you a great variety of additional remedies that have been used with more or less benefit in different forms and stages of rheumatism; but if I have enabled you to see clearly the objects to be accomplished, a proper knowledge of your *materia medica* will furnish you an ample number of remedial agents from which to choose. Consequently, I will detain you for only one further suggestion. In all cases where the circumstances of the patient will permit, a permanent change from a residence in a cold, damp and variable climate, to one that is mild and dry, will be the surest mode of obtaining permanent relief. Of course, even this will not restore those old cases of chronic deformity from hypertrophy and induration of ligaments, tendinous adhesions, and atrophied muscles; but those in which the morbid changes are less structural, or more recent, great benefit may be derived from the change. So, where the rheumatic diathesis is strong, temporarily residing in a mild and dry climate during the most wet and variable parts of each year, will often enable the individual to avoid attacks from which he would otherwise suffer. Mineral waters containing a large proportion of the alkaline carbonates, may also be used with advantage in many cases, both for drinking and warm bathing.

LECTURE XXXII.

Gout—Its History, Causes, Symptoms, Morbid Anatomy, Diagnosis, Prognosis, Treatment and Prophylaxis.

GENTLEMEN: The disease to which I shall invite your attention during the present hour, is not one that you will meet often in the ordinary field of practice outside of the older cities of our country. Podagra, arthritis, or gout, as the disease has been called by different writers, is pre-eminently an affection originating in the midst of civilization and luxury. It was recognized and accurately described by the earlier medical writers, though not always differentiated from rheumatism with which it has some symptoms in common. The word gout, and all the other names applied to the disease, relate to an affection accompanied by deposits in or about the joints, and consequently is suggestive of a mere local disease. But like rheumatism, it always involves more or less alteration of the properties of the tissues generally, in such a way as to give the individual a constant and strong tendency to develop certain local morbid phenomena on the occurrence of any exciting cause. When this alteration in the properties of the tissues or general constitutional condition is once established, it is seldom entirely removed, and is readily transmitted to the offspring.

Causes.—Both the predisposing and exciting causes of gout are well understood. The former consist chiefly of hereditary influence, the habitual use of rich food, fermented alcoholic drinks, and very little outdoor exercise. The coincidence of the three last influences without the first, if continued for several years, is sufficient to develop the disease in any of its active forms. But they will induce the same result much earlier and more readily if the hereditary predisposition aleady exists.

The free use of meats and other nutritious articles of food, requires for their proper disposition in the human system, a conicident full supply of oxygen to the blood as it passes through the lungs, and an active state of all the excretory or eliminative functions. You are all familiar with the physiological fact that all eliminations are increased by physical exercise and diminished by rest. And no fact is better established than that the presence of a small quantity of alcohol in the blood, such as is supplied by a moderate daily use of beers and wines, decidedly diminishes both the oxygenation and decarbonization of the blood as it passes the air cells of the lungs. It is plain, therefore, that if the supply of new material through the digestive organs continues abundant while the supply of oxygen through the lungs and the activity of the excretory processes are both diminished by a daily moderate supply of alcohol from fermented drinks and too little physical exercise, we shall necessarily have retained in the blood and tissues an excess of materials that should have been further oxidized and eliminated. The habitual presence of this excess of materials, so alters the properties governing the molecular movements, as to result in the final establishment of a morbid constitutional condition or diathesis, and the development from time to time of the active local phenomena of gout.

From the investigations of Dr. Garrod and others, it appears well ascertained that the prolonged operation of the causes I have just detailed finally results in the accumulation, in the serum of the blood, of a large excess of uric acid and urate of sodium, which become the direct exciting causes of the local development of acute and chronic gout. When a well marked gouty diathesis has been inherited, the individual may suffer from

the neuralgic and other chronic forms of gout, without any personal errors of diet or modes of living; and even acute attacks may be produced in such by sedentary habits and free indulgence at the table, without any use of alcoholic drinks.

But I doubt whether the disease is ever produced, *de novo*, in persons having no previous hereditary tendency, without the habitual use of some variety of alcoholic drink.

As you will infer from what I have said concerning the predisposing causes of gout, the active forms of the disease seldom occur until near the middle period of adult age. It is also much more frequently met with in males than females. The disease prevails most in countries and communities where the social habits of the people lead to the daily moderate use of wines and malt liquors, with comparatively little of the distilled spirits. The free use of the stronger liquors, as whisky, brandy, rum and gin, leads more directly to functional and structural diseases of the stomach, liver and kidneys, and seldom develops the gouty diathesis. But the efficiency of the fermented drinks, in producing the disease, appears to be in direct proportion to the percentage of alcohol they contain. For a very interesting illustration of the effects of social and hygienic habits on the production of diseases, including all the varieties of gout, I refer you to the chapter in one of the volumes of "Medical Inquiries and Observations," by Dr. Benj. Rush, in which he compares the social customs and diseases prevalent in Philadelphia during the ten years preceding the commencement of the War for Independence in 1775, with those of the ten years following the close of that war in 1782.

Where the diathesis or constitutional condition already exists, an acute attack or paroxysm of local gouty irritation may be induced by a variety of temporary exciting causes, as severe and protracted mental application or anxiety; undue physical exercise, or exposure to cold and wet; and excesses in eating and drinking. Working in contact with lead is thought to favor the development of the disease. It is more prevalent in the temperate than in either the tropical or the more extreme cold climates. It is much more prevalent in the older cities in the eastern part of our country than in those of the western. The difference, however, is owing much more to the differences in the social habits of the various communities and nations than to any influence of climate or topography. During an active practice of more than thirty years in this city I have seen but very few cases of gout, except in persons who had a plain hereditary predisposition, or had brought the disease with them from some older community.

Clinical History or Symptoms.—The cases of gout, as they are met with by the physician, may be grouped for convenience of description under the familiar names of acute and chronic. An attack of acute or transient gout is generally sudden, and often without warning, although in many cases the patient has been suffering for the two or three preceding days from indigestion, flatulence, mental depression or irritability of temper, etc. And sometimes an attack comes as the direct result of one or two days or evenings of excessive debauchery. The acute symptoms usually commence during the middle or last part of the night, and consist of a severe pain in some one of the joints, most frequently in the proximal joint of one of the large toes, coincidently with first, slight chilliness, and subsequent quick development of general fever. The skin becomes hot and dry; face a little flushed; tongue often covered with a white fur; some thirst; pulse from 100 to 110 per minute and generally full; urine

scanty, high-colored, and deficient in uric acid; and general restlessness. But the symptom that overshadows all others and occupies the entire attention of the patient, is the intense aching, gnawing pain in the toe, or whatever part is attacked with the inflammation. The articulation affected quickly becomes swollen, red upon the surface and most acutely sensitive to the touch and to the slightest motion. In the more acute and severe cases to which I am now alluding, both the local pain and general fever reach their highest intensity, in from two to four hours. After remaining nearly stationary for one or two hours more, they begin to decline. The patient becomes less restless, and sometimes has short intervals of sleep; and in from two to four hours more his fever and severe pains have disappeared, leaving him feeling weak and weary, with a continuance of the swelling, redness, and tenderness of the toe, but with little continuous pain. From this description you will see that an ordinary paroxysm may last from six to twelve or eighteen hours. On its subsidence the skin may become moist, the urinary secretion abundant, followed by a rapid diminution of both swelling and tenderness, and in two or three days the patient appears as well as usual.

In a large proportion of cases, however, the subsidence of the active symptoms proves only a remission which continues until the middle of the following night, when another exacerbation begins, and presents the same symptoms, both local and general, as in the first. The paroxysms may continue thus to return every night, for a week or even longer, and in the meantime the local inflammation may have extended to all the articulations of the toes and sometimes to the ankle, or even to the articulations of the fingers and hands. In such protracted attacks, the patient becomes much more debilitated, the swelling and tenderness of the inflamed articulations, subside slower and less perfectly, with much more tendency to pass into the chronic form. Yet many of these more severe and protracted attacks are recovered from so perfectly that in two or three weeks the patient feels more buoyant and in better health than for sometime before the attack. But the susceptibility of the system to the disease increases with every new paroxysm, until such patients as have suffered several attacks, become subject to their recurrence from the slightest causes.

In some cases the attacks are characterized by the same local pains, swelling, redness and extreme tenderness that I have described, but with much less general fever. These have been classed by some writers as subacute gout. In some cases of both acute and subacute attacks, the inflammation, after progressing a short time in the usual articulations, suddenly recedes, and is immediately manifested in some one of the internal organs, as the stomach, lungs, heart or brain; and with the rapid development of all the usual symptoms of acute inflammation of the organ attacked. Such cases are called *retrocedent*, or misplaced gout, and are very dangerous to the life of the patient. Happily, they are not of very frequent occurrence.

Chronic Gout.—The greater number of cases of chronic gout are the sequelæ of acute attacks, and their local manifestations are of an inflammatory character. But more rarely cases are met with in persons of both sexes, which are characterized by periods of extreme pain without accompanying inflammation, and without having been preceded by any acute inflammatory attacks. These cases are usually classed as neuralgic gout, and are probably met with only in persons having a strong hereditary predisposition. When after repeated attacks of acute arthritic inflammation, the affected articulations remain constantly more or less swollen, purplish-

red, tender to pressure, stiffened, and painful when motion is attempted, but without general fever, the disease is said to have assumed a chronic form; and may continue thus during the remainder of the patient's life. Such cases are subject to frequent temporary periods of increased activity with marked aggravation of the suffering of the patient; sometimes from atmospheric changes, but more frequently from excesses in mental or physical labor and errors in diet and drink. Unless great care is exercised in avoiding all the causes that tend to increase the disease, the tendency of chronic cases is to gradually increase, both in the local developments and in the general impairment of health. The affected articulations become slowly increased in size, the tissues more indurated, and the joints less movable. This is owing in part to the sclerosis, or hypertrophy of the inflamed fibrous tissue composing the ligaments, synovial membranes, and connective tissues belonging to the affected articulations, and partly to the deposit of urate of sodium, calcium, etc., both into the cavity of the joints and into the surrounding tissues. In some cases of long duration, these deposits become so large as to cause, by their pressure, the absorption of the soft parts covering them and the protrusion of naked inorganic crusts at the most prominent part of the articulations.

While such external local changes are taking place from year to year, there are progressive internal changes of no less importance, that should receive your attention. In most cases the functions of digestion and assimilation become more impaired, as indicated by gaseous eructations, frequent turns of gastric acidity, and alternations of constipation and diarrhœa, with progressive impoverishment of the red corpuscles of the blood. The urine becomes habitually scanty, and sometimes albuminous; the feet and ankles begin to show some œdematous infiltration while dependent during the day; a little exertion causes shortness of breath, palpitations, and sometimes faintness; and finally general dropsy supervenes, and the patient approaches near to the end of life. The final result may be reached in various ways. In some cases the general dropsical infiltrations simply continue to increase, with corresponding diminution of the urinary secretion; the mind becomes dull and somnolent; the breathing heavy and slow; pulse soft, irregular or intermitting; the whole exterior of face, body, and extremities much bloated from the dropsical infiltrations; finally, muscular twitchings, cold extremities, suppression of urine, irregular and stertorous respiration, entire coma and death supervene. In some cases, either from fatty degeneration or overwhelming pericardial effusion, death takes place more suddenly from failure of the heart's action. Or from a similar fatty degeneration of the coats of the arteries of the brain, some weakened vessel gives way, allowing hæmorrhagic exudation or extravasation into the texture of the brain, and death by apoplexy or paralysis. In still other cases respiration is overwhelmed either by pulmonary œdema or pleuritic effusion. Such is a very brief description of the general course and terminations of chronic arthritic gout, when it proceeds to its own legitimate results. But patients subject to chronic gout, are more or less prone to intercurrent attacks of acute inflammation of important organs which often prove fatal before the gouty disease has reached the ultimate changes I have just described.

Pneumonia, pleurisy, endo- and pericarditis, gastro-enteritis, and acute and chronic nephritis are among the most common intercurrent inflammatory affections to which gouty patients are subject.

The neuralgic form of chronic gout is less uniform in its characteristics, and more difficult to distinguish from other forms of neuralgia. It is usually characterized by the sudden attack of very severe pain in some particu-

lar part, without any premonition or warning, its unremitting continuance from one to six or eight hours without general febrile disturbance, and leaving the part without swelling or other visible changes. In some cases the patient endures but a single paroxysm of the pain; and in others it recurs at intervals of a few hours for several days in succession.

The locations most frequently the seat of pain, are the same as those most frequently attacked by inflammation in the acute form of the disease, namely the articulations of the toes and feet, those of the hands, and the stomach. One of the best characterized cases that has come under my observation, was that of a well-educated lady of most correct habits of life, but whose ancestors, through two or three generations, had suffered severely from gout. For several years she had been attacked two or three times a year, with the most excruciating pain in the proximal joint of the great toe. It usually came suddenly, without warning, and so severe as to render her entirely helpless while it lasted, which was usually six or eight hours, unless sooner relieved by remedies. The first occasion of my seeing her, she had been attacked with the pain while on the street, and had been obliged to have a carriage called to take her home. I recollect only three cases in which the epigastrium was the seat of pain. Two were males, and one a female of sedentary habits; and all belonged to families in which the hereditary gouty diathesis was strongly marked.

Morbid Anatomy.—The changes that take place in the fluids and solids of the body in connection with gout, have been investigated with much care. The earliest and most marked change in the blood is the decided increase of uric acid and uric acid salts, particularly the urate of sodium. The existence of this excess of uric acid as a characteristic condition of the blood in acute gout was perhaps first suggested by Murray Forbes, but not fully proved until the more valuable investigations of D. Garrod, published in 1854. As the disease progresses, the red corpuscles and the albumen both fall below the natural proportion, while the fibrin is increased. For a few days before, and during the early stage of, an attack of gout, the urine has been found to contain less than its natural proportion of uric acid, and in some instances an increase of the phosphoric. In the structures constituting the seat of the local inflammations in all stages of gout, there has constantly been found more or less deposition of urate of sodium, both in the form of acicular crystals and of granules. In recent cases these deposits appear in white lines or layers on the articular surfaces, and in the ligamentous and other tissues surrounding the affected joints. In older cases they accumulate in thicker layers or masses called tophi or concretions; and in such they are also found in many other parts of the body, more especially in the tubules of the kidneys, the sheaths of tendons and nerves, and in the membranes of the spinal cord. When the tophi or concretions in and about the joints become large, they usually contain, besides the urate of sodium, urates of magnesium and calcium, with more or less of the carbonate and phosphate of calcium.

In many cases of long standing, the structure of the kidneys not only contains the uric acid deposits, but it has undergone more or less granular degeneration and atrophy, giving it the appearance of the small granular kidney of Bright's disease, and constituting the *gouty kidney*, of Dr. Todd. Waxy degeneration of the renal structure has also been observed in some cases; and in some, fatty and atheromatous changes have been found in the heart and in the coats of many of the arteries. The special pathology of acute and chronic gout is sufficiently indicated in the comments I have made on the causes, and morbid anatomy of the disease.

Diagnosis.—The only diseases with which gout is liable to be confounded are rheumatism, neuralgia, and rheumatoid arthritis.

The difficulty chiefly relates to the earlier attacks of acute articular gout. If you keep in mind the facts that this variety of gout seldom occurs before thirty years of age, that it almost always attacks the small articulations of the extremities and very generally, first the proximal or metatarso-phalangeal joint of the great toe; that the pain is much more intense and aggravating, compared with the general febrile disturbance; that the tenderness is more acute and the redness deeper; and finally, that the patient's habits of life and perhaps hereditary predisposition, have been entirely different from those favoring the development of rheumatism, you will find but little difficulty in arriving at a correct diagnosis at once. If there remain doubts, however, you can obtain eight or ten cubic centimeters (fl ʒii or ʒiiss) of the serum of the blood, either by scarifying and cupping, or by a blister, and apply to it any of the well-known tests for detecting uric acid or urate of sodium, the presence of which would confirm the diagnosis of gout. In chronic cases of articular gout, the simple clinical history of each case, with due attention to the present condition of the affected articulations, will be sufficient to establish a proper diagnosis. In neuralgic gout the diagnosis must be determined mainly by the intensity and location of the pain, the time and manner of its recurrence, and the hereditary tendencies of the patient. Its differentiation from rheumatoid arthritis will be more appropriate after I have described that form of disease.

Prognosis.—Except in the cases of retrocedent gout, in which some important internal organ has become the seat of the gouty inflammation, there is but little danger of a fatal result during the acute stage of the disease. Yet the gouty diathesis is seldom wholly removed by any method of treatment that has been devised; and when the local inflammations have recurred many times, they are almost certain to induce a sufficient degree of structural changes in the kidneys and other important organs, to materially shorten the duration of life.

Treatment.—A proper knowledge of the causes and pathology of gout will suggest three distinct and important objects to be accomplished in its treatment; namely, the removal of the special exciting cause, supposed to be an excess of uric acid and urates, from the system; the alleviation of the intense suffering; and the prevention of the re-accumulation of the exciting cause for the purpose of avoiding a relapse or a new attack. The first of these objects may be accomplished by remedies that either neutralize the action of the uric acid and urate of sodium by forming new compounds with them, which are either harmless or more readily eliminated through the natural channels of excretion, or by such as rapidly diminish their formation on the one hand, and increase their elimination by causing increased action of the skin and kidneys on the other. The particular remedies that have been found by clinical experience to act most efficiently in the first direction, are the bicarbonate of potassium, carbonate, bromide and citrate of lithium, and phosphate of ammonium; while of those that act in the second direction, colchicum stands pre-eminent, having maintained its reputation undiminished from the earliest records of medicine in Greece and Rome to the present time. Recently jaborandi, from its known efficacy in producing copious diaphoresis, has been used in some cases and with decided advantage. To fulfill the second indication, by temporarily mitigating the intensity of the pain, the preparations of opium, especially when given in connection with colchicum, are by far the most efficient that we can use. Some effect may be produced by the use

of chloroform, hyoscyamus, belladonna, and aconite; but they are much less reliable than the opiates. The same may be said of the chloral hydrate and the bromides.

In the limited number of cases to which I have been called during the active paroxysms of acute or subacute gout, I have given promptly a combination of the wine of colchicum root, two parts, and the acetated tincture of opium one part, in doses of two or three cubic centimeters, (min. xxx or xlv) repeated, at first, in one or two hours until the pain and fever abated and then at longer intervals until the paroxysm had wholly subsided. In none of the cases coming under my own observation, has this combination failed to afford speedy and satisfactory relief from all the more active symptoms. There are cases, however, in which the opiates are promptly rejected by the stomach, or soon create much nausea and depression. In such cases I would substitute the bromide of lithium in the place of the opiate, in combination with colchicum. One of the benefits of combining an opiate with the colchicum, in addition to its effect in relieving pain, is the lessening of the tendency of full doses of the latter to operate harshly on the bowels before its specific effects are obtained in checking the production of uric acid and promoting its elimination. When it is found that the acute paroxysm has supervened while the bowels were constipated or inactive, the tongue coated, and skin hot and dry, much benefit may be derived by giving at once five decigrams (gr. viii) of calomel and following it in three or four hours by sufficient Rochelle salts to cause two or three free evacuations from the bowels. This, however, should not prevent or delay the use of the colchicum and opiate as already described.

Recently some cases have been reported, in which liberal doses of the salicylates have been given, and apparently with prompt and satisfactory relief. If given in this disease, the salicylate of potassium is preferable to that of sodium, as the latter already exists in excess in combination with the uric acid, both in the blood and the inflamed tissues. When the acute paroxysm has been fairly relieved and the patient restored to a comparatively comfortable condition, then, the means for fulfilling the third indication should be resorted to without unnecessary delay, in the hope of preventing the re-accumulation of the uric acid and urates in sufficient quantity to produce another paroxysm. This cannot be accomplished by any kind or amount of medication alone. Moderate doses of the wine of colchicum may be continued three times a day, either by itself or combined with the bromide or citrate of lithium, until the change in the diet, drinks, and exercise of the patient has had time to re-establish a healthy condition of the nutritive and excretory functions of the whole system. Particular attention should be given to the condition of the digestive organs, both in regard to the functions of the stomach and the regular evacuation of the bowels. If the food lies heavy, feeling like a load or weight in the stomach and the bowels are costive, you may know that there is both deficiency in the gastric secretions and in the peristaltic motion of the bowels. Some combination of a tonic and laxative will be needed for correcting these deficiencies. Perhaps none can be made better adapted to this purpose than the following:

℞	Extracti Hyoscyami	2.0 grams	gr. xxx.
	Ferri Sulphatis	2.0 "	" "
	Extracti Colocynthidis	2.0 "	" "
	" Nucis Vomicæ	0.6 "	" x.
	Pilulæ Hydrargyri	0.6 "	" "

Mix. Divide into thirty pills, one of which may be taken each night, or each night and morning, as found necessary to secure one regular evacuation each day. But whatever may be the kind of medicine administered, no permanent relief will be obtained unless a judicious and persistent regulation of the diet, drinks, and exercise of the patient accompanies and follows it. The diet should consist chiefly of milk, farinaceous articles, vegetables and fruit, with meat only sparingly. Tea and coffee may be used moderately, but alcoholic drinks of every kind, whether fermented or distilled, should be entirely excluded from use. You will see it stated by authors of deservedly high reputation that the *weaker* wines and small quantities of gin may be allowed, especially to patients who have long been habituated to their use, or have become much debilitated. With all proper deference to the opinions of others, I must caution you against such statements as conveying an important error. They are founded on the idea that alcohol in small quantities in the forms mentioned, helps to sustain the strength and nutrition of patients already habituated to their use and debilitated by attacks of gout or other forms of disease. From many years of observation and direct professional management of patients accustomed to the use of alcoholic drinks both in hospital and private practice, I am satisfied that no form of those drinks can be made to act as a tonic or as a promoter of healthy nutrition. I have never known a patient injured, or a life endangered, by stopping their use too suddenly, or abstaining from them too persistently. But I have known very many to be injured and finally lost, by persisting in the effort to use them moderately. And the sooner a patient, predisposed to attacks of gout, omits entirely the use of all fermented or distilled drinks, the more readily will he make genuine progress in removing such predisposition, and in securing permanent exemption from new attacks.

Another item of great importance in the management of these cases, is the proper regulation of the patient's exercise, both mental and physical. Whenever the patient is sufficiently free from acute symptoms to get out of the house, it is desirable that the mind should be occupied if possible by a few hours of daily attention to some light, cheerful business, that will serve to divert attention from himself and promote habitual action of the mental faculties. But all business involving protracted and severe mental application, anxiety or depression, should be avoided, so far as circumstances will permit. A certain amount of physical exercise in the open air is of paramount importance. Riding, either in an open carriage or on horseback, walking when the joints will permit, or even engaging lightly in physical sports, should be resorted to daily, with as much regularity as in eating or sleeping. When these regulations cannot be secured at home, the patient should be encouraged to travel in mild climates, or visit and use those mineral springs, either in this country or in Europe, the waters of which promote habitually increased elimination of effete matter through the urinary and cutaneous structures.

The remedies, hygienic and medical, that I have mentioned as best calculated to prevent a repetition of acute attacks, are equally applicable in the treatment of all grades of chronic gout. When the latter form of the disease has been of long standing and the blood is much impoverished of its red corpuscles, with perhaps some œdema of the lower extremities, a moderate dose of citrate of iron and quinine taken after each meal-time, may be found beneficial, as an aid to other remedies.

When general dropsy has supervened accompanied by scanty and albuminous urine, it very generally indicates such a degree of structural change in the kidneys as to render the prognosis altogether unfavorable. Palli-

ation of symptoms and a rational effort to render the patient as comfortable as possible, will constitute the chief objects of treatment in such cases. When acute gout is misplaced or retrocedent, attacking important internal organs, it must be treated on the same principles, and, so far as the functions of the organ attacked will permit, by the same remedies, as in ordinary acute cases.

You will occasionally meet with cases presenting an intermixture of the symptoms of gout and rheumatism; or with cases of rheumatism engrafted upon an inherited gouty constitution. Nearly all such cases can be most readily relieved by the judicious use of the salicylate of sodium, combined with the wine of colchicum, or by a combination of the bromide of lithium with the alkaline carbonates, in conjunction with warm alkaline baths, and the same hygienic regulations as in similar grades of unmixed gout.

ARTHRITIS DEFORMANS.

This may be as convenient a time as will be likely to occur for saying a few words in relation to a disease called by some writers arthritis deformans, and by others rheumatoid arthritis; although it is doubtful whether it has any of the elements of gout in its nature. It occurs more frequently in women than in men, and chiefly in subjects who have been much exposed to physical hardship and mental cares or anxiety. It seldom occurs in childhood or youth, but is most frequent from the middle period of adult life to old age. It usually attacks first the larger joints, as the hip, knee, shoulder, and elbow, and extends subsequently to the smaller joints of the hands and feet. It does not attack many articulations at the same time, but commences in parallel joints on each side and extends symmetrically from one pair of joints to another progressively, until in some cases it has involved nearly all the articulations in both body and extremities, and rendered the patients utterly helpless. The joints, when first attacked, present much the appearance of subacute rheumatism, being moderately swollen, tender, painful, especially on attempting motion, but with little or no general fever. In the early stage effusion of serum sometimes takes place into the synovial membrane, increasing for a time the size and shape of the joints. This subsequently disappears and the synovial membranes generally become unnaturally dry and the joints stiff, or creaking from friction on motion. The pain is dull, aching in character, and increased by attempts to move the affected parts. Slowly those parts of the cartilages covering the articular surfaces of the bones that are subject to direct pressure, become absorbed; sometimes to such an extent as to leave the surfaces of the bones naked in contact with each other. At the same time the edges of the cartilages become thickened irregularly, presenting hard nodules. The same thickening and induration take place in portions of the synovial membranes, periosteum and ligaments, making the joints appear large and irregular in shape. Occasionally a hard nodule will be formed in the mere projecting fringe that often appears on the edges of the articular cartilages, and will become detached and form a loose or floating cartilage in the joint. All these changes appear to consist of an increase or proliferation of the natural histological elements of the cartilaginous and fibrous tissues. In some cases phosphate of calcium or bony matter has been found in the more prominent nodules, but never the urates or chalky materials common to gout. Neither has there been found an excess of uric acid or urates in the blood of this class of patients. The changes I have described often cause much deformity especially in old people. The fingers and toes not only become

stiff, but turned in various directions, the former chiefly toward the ulnar, and the latter toward the fibular side of the extremities. In a large proportion of the cases the muscles undergo more or less atrophy, and the patients become pale and thin, though retaining a good appetite and fair digestion. Indeed there appears to be little or no tendency in this class of cases, to disease of either the cardiac, pulmonary, or digestive organs; and we consequently find the patients with the functions of all these organs well performed, who have been entirely helpless for years, from the progressive and persistent morbid changes in the organs of locomotion. It is only a few days since I saw in the north part of the city, a woman about fifty years of age, mother of a large family, who had lain in the condition just described between five and six years. Not one of her limbs could be straightened or moved sufficiently to get the bottom of a foot to the floor or a hand to her head.

The special pathology of this class of cases is not well understood. That it is essentially different from either rheumatism or gout, is evident, both from their clinical history, and the nature of the structural changes developed during their progress. That the disease consists of a morbid increase of that property of the structures involved, which I have called susceptibility or irritability with a perversion of the affinity governing the movement of atoms, the symptoms and structural changes plainly show. But whether this alteration of the properties of the tissues results from the presence of some retained morbid material, as in rheumatism and gout, or from alterations in the supply of blood, through disturbance of the vasomotor or trophic-nerve function, cannot be definitely determined without further investigation. Many years since, Dr. J. K. Mitchell, of Philadelphia, claimed that the primary seat of morbid action in articular rheumatism, and other affections of the joints, was in the spinal cord. And several of the eminent neurologists of the present time confidently claim that arthritis deformans, as well as progressive muscular atrophy, is the result of disease in what they term the trophic nerve tract or center in the lateral columns of the spinal cord.

Treatment.—Whatever may be the theories we adopt in regard to the essential pathology of the disease under consideration, it is certain that the remedies which have been found most efficacious in the treatment of rheumatism and gout, have no influence in controlling its progress. The cases that have come under my own observation, have been most benefited by much rest in a horizontal position; the application, for ten or fifteen minutes each day, of gentle currents of electricity, accompanied by light friction over the diseased articulations and the muscles connected with them; the use of a fair variety of plain nutritious food, allowing tea and coffee only moderately, and entirely prohibiting alcoholic drinks both fermented and distilled, and tobacco; and the administration of a combination of iodide of calcium, oxide of calcium, and stramonium, as in the following formula:

℞	Syrupi Calcii Iodidi	130.0 c. c.	℥iv
	Syrupi Calcii Oxydi	60.0 "	℥ii
	Tincturæ Stramonii	15.0 "	℥ss

Mix. Shake the vial, and give to an adult four cubic centimeters (fl ʒi) each morning, noon, tea-time, and bed-time, in a tablespoonful of water. My observations have led me to think that if the disease should be correctly diagnosticated in its early stage, and the plan of treatment I have suggested, adopted and faithfully executed for two or three months, a

large proportion of the patients would recover. Unfortunately, however, a large proportion of the cases are either neglected or treated as chronic rheumatism, until the structural changes have become too extensive to admit of repair or recovery.

I have now completed the consideration of all those diseases which I had classed under the head of constitutional affections, so far as they come under the care of the physician, and will be ready at the next lecture hour, to enter upon the consideration of the great class of *local*, as distinguished from acute and chronic general diseases.

LOCAL DISEASES.

LECTURE XXXIII.

General Remarks—Inflammation—Its Nature, Varieties, Anatomical Changes or Results, and the Principles involved in its Treatment.

GENTLEMEN: Having in the preceding lecture completed the consideration of the first great class of human maladies, embracing the acute and chronic general diseases, I now invite your attention to the second class, which embraces all the remaining forms of disease under the name of local affections. The definition of the words *general* and *local* as applied to the designation of different forms of disease and the distinctive features of each class thus designated, were sufficiently considered in the sixth lecture of the present course.* In the same lecture, I grouped all the local affections into four divisions or sub-classes, calling them respectively inflammations, fluxes, neuroses, and miscellaneous or unclassifiable cases. I shall now proceed to consider each of these sub-classes in the order in which they were named. The diseases included in the first subclass, called phlegmasia, or local inflammations, are among the most frequent and important affections that come under the care of the physician. The subject of inflammation, like that of fever, has occupied the attention of the profession from the earliest periods of medical history; and upon these two forms of morbid action have been based all the so-called, great systems of medical philosophy of past generations. Until a recent period of time all attempts to define inflammation, consisted in a simple enumeration of the more prominent symptoms presented during the active stage of the disease, namely heat, redness, swelling, and pain. It is true that when a part or a structure is hot, redder than natural, swollen, and painful, it is inflamed. But these several phenomena do not constitute the disease. They are simply results or symptoms by which the presence of the disease is made known. And there is not one of them that may not be absent in some particular case.

Essential pathology.—If we apply the same analytical method to the study of the morbid condition called inflammation, that we adopted in relation to the essential pathology of fevers, we will find it to involve four elements or factors, two of which are essential and uniform and the other two variable. The four elements that constitute factors in every inflammatory process, are, the properties of the tissue involved, which I have called *susceptibility* and *vital affinity* and the *quantity* and *quality* of the blood. The susceptibility or irritability is always exalted and the quantity of blood increased in every case of inflammation. If the susceptibility of the structure is exalted without any accumulation of blood it constitutes simple irritation. When there is accumulation of blood in the vessels of the part, without any increase or exaltation of the susceptibility

*See Lecture VI, pp. 48-52 of this volume.

of the texture, it constitutes simple congestion. When the two co-exist in the same structure they constitute the first and essential step in the inflammatory process. I call them the constant elements, because they are not only always present, but always altered from their natural condition in the same direction, though not uniformly in the same degree. The vital affinity inherent in all living matter and the quality of the blood, are factors present also in every case: but the first may be increased above or diminished below its natural standard, or it may be perverted in a direction differing from either simple increase or diminution of activity, while the second may have its plastic elements increased, (hyperplastic) diminished, (aplastic) or it may contain foreign constituents, either generated in the system or imbibed from without, rendering it toxæmic. Therefore I call the vital affinity or property that regulates the movement of organic atoms, and the quality of the blood, variable elements of the inflammatory process.

And a further study will show, that it is the variations in these elements or factors, which cause the diversities in symptoms, progress, and results, so constantly met with in different cases of inflammation. When the properties of a structure have been disturbed and blood has accumulated in its vessels, constituting the first step in the morbid process called inflammation, these conditions never remain stationary. If the morbid excitability and the fullness of blood can be at once relieved, the morbid process is arrested and the structure restored to its natural or healthy condition. In other words the inflammatory process is rendered abortive or is cut short in its incipiency. If such a result is not obtained, further changes take place which have been carefully studied with the aid of the microscope, both in the living tissues and after their death. Under the microscope, both the blood and the vessels which contain it are seen rapidly undergoing important histological changes.

At first the arteries dilate, then the veins, and to a less degree the capillaries. Coincidently the flow of the blood-current is increased, but after a somewhat variable time it becomes slower than normal, and in some cases even stasis takes place in the capillaries. As it slackens its speed the white corpuscles begin to cling and gather along the walls of the veins and capillaries, the red blood still flowing through the center. The white corpuscles then begin to migrate. By their amœboid movements, or the increased affinity of the tissue, they push through the intercellular cement of the lining endothelium. Outside the vessel they become actively amœboid and change their position through the surrounding tissue. At the same time, as a rule, a few, though exceptionally very many, red corpuscles also pass from the vessels. The fluid-portion of the blood also filters out. These changes constitute the process of exudation. The exudate, thus formed, resembles blood plasma, but contains somewhat less albumen. The migrated white blood corpuscles are undistinguishable from pus cells. Whether they are the sole origin of these cells or whether all tissue-cells proliferate and produce the pus cell, is not as yet definitely settled by histologists.

The subsequent steps in the inflammatory process, and the changes involved in it, will depend entirely upon certain other coincident conditions.

If there is an accumulation of healthy, plastic blood, an increased susceptibility, and free play of vital affinity, as occurs in the ordinary sthenic or active form of inflammation, a plastic exudation is produced. The liquor sanguinis, which permeates the tissue, is of such quality, that influenced by active vital affinity, it speedily undergoes solidification and

more or less complete organization. As the interstitial spaces are filled with this solidified and organized exudate, two things are caused: an increase of bulk or swelling, and an increase of density or hardening of the tissue. Of course, the increase of blood causes an increase of redness; and the active play of vital affinity, the rapid exudation and its organization, develops a rise in temperature; the coincident irritation and the pressure of the exudate cause pain; and thus by successive steps you have rapidly developed all the symptoms of phlegmonous or active sthenic inflammation, symptoms which are crystalized in the classic words: tumor, rubor, calor, dolor.

But there are other conditions which may modify this result. Suppose, instead of the coincidence of active, vital affinity and a healthy plastic condition of the accumulated blood, the vital affinity is lowered and the blood aplastic: What will be the result? Exudation will take place, and, perhaps, more rapidly than in the other case, as the walls of the capillaries and arterioles, uninfluenced or but slightly influenced by vital affinity, readily relax, become distended, and yield to the pressure of the accumulated blood. The liquor sanguinis, which permeates the surrounding tissue, owing to its aplastic condition and general lack of vital force, remains unorganized, or organizes very slowly. The tumefaction, which takes place, is not, therefore, accompanied by induration, but the tissue, though swelled and red, is only moderately increased in density, and ultimately tends to soften and disintegrate, or undergo diffuse suppuration. Good examples of this variety are seen in the local asthenic inflammations that accompany typhoid and other low grades of general fever.

A third condition of the blood that may cause important modifications of the inflammatory process, arises from the presence in it of some one or more foreign substances having properties which are capable of either interfering with the ordinary molecular movements and combinations, or of altering the vasomotor influence over the action of the vessels of the part in a way different from simple increase or diminution. To this class of agents belong all the specific contagiums and infections. Their presence in the blood of a part excites or exalts the susceptibility, and perverts or changes from its natural direction the affinity that controls the movements of organic atoms, by which new and specific combinations are formed. The inflammations accompanying the eruptive fevers, erysipelas, gout, etc., are familiar examples of this variety. From this elementary or analytical study, you will see that all cases of inflammation may be included under three heads, which, for want of better terms, I call sthenic, asthenic, and specific.

The elements or factors involved in each, and their differences, will be seen by the following table which I place on the blackboard:

VARIETIES OF INFLAMMATION.	STHENIC.	Susceptibility of structure exalted. Quantity of blood increased. Vital affinity increased. Quality of blood plastic.
	ASTHENIC.	Susceptibility of structure exalted. Quantity of blood increased. Vital affinity diminished. Quality of blood aplastic.
	SPECIFIC.	Susceptibility of structure exalted. Quantity of blood increased. Vital affinity perverted. Quality of blood toxæmic or poisoned.

You readily perceive that the differences between the sthenic and asthenic depend upon the variations in the vital affinity of the texture and the natural plastic elements of the blood; while the peculiarities of the specific inflammations are owing to the presence in the blood of a foreign toxæmic or poisonous agent. The two first admit of cases varying much in the degree of alteration in the elements involved until those called plastic or sthenic, and the aplastic or asthenic, meet so nearly on the dividing line that the practitioner may properly hesitate in deciding under which head a given case before him should be placed.

Results or Terminations of Inflammation.—The inflammatory process, when it progresses beyond the first stage of its existence, may terminate by resolution, by formation of new tissue, by suppuration, and by gangrene. As I have already explained, the first stage of inflammation consists of simple morbid excitability of the structure and accumulation of blood in its vessels; and the second embraces the period during which more or less of the constituents of the blood are passing through the walls of the capillaries into the interstitial spaces, and is often called the stage of exudation. The first is usually very brief, occupying from six to twenty-four hours. The second more generally continues from two to five days; and is followed by the third or stage of decline, during which the results of the inflammatory process are developed, either in resolution, the permanent organization of new or false tissue, the formation of pus (suppuration), or the death of the part (gangrene). These diverse results which are liable to be developed during the third stage, depend entirely upon the quantity and quality of the exudation material and the condition of the vital affinity of the structure involved. If the amount of the exudate, whether plastic or aplastic, is moderate, and the affinity or property regulating the movement and combination of organic atoms or molecules not much below the natural standard of activity, it generally begins to undergo disintegration and removal by re-absorption as soon as the exudative process is arrested, and in a few days the whole is removed, leaving the original structure in its natural condition. This constitutes the termination by resolution.

If the amount of the exudate is moderate and decidedly plastic with an active state of vital affinity, as in acute rheumatic and other sthenic grades of inflammation, it not only undergoes rapid solidification, but its molecules are arranged into cells, nuclei, and granules, which become more or less assimilated in form and function to the normal tissue in which the exudation occurs. The structure thus becomes hypertrophied and often permanently much embarrassed in the performance of its function. The thickened and indurated valves following endocarditis; the sclerosis of the connective tissue of the lungs, resulting in some cases from pneumonia; and parallel changes in the parenchyma of the liver, spleen and other organs, resulting from attacks of active inflammation, are all familiar examples of inflammation terminating in the formation of new tissue. When the serous membranes are the seat of the same grade of inflammation, the blood plasma, containing the plastic materials, exudes upon the surface of the membrane, the endothelial cells of which are pressed apart or detached, and a deposit of fibrin, holding in its meshes white corpuscles and granular matter, accumulates. At the same time the connective tissue cells of the surface enlarge and become more or less imbedded in the layer of exudate. These cell structures multiply, a new basement substance is formed, in which new blood vessels appear, while the fibrin and serous fluid are removed by absorption, and a layer of complete connective tissue is left in the form of a false or new membrane closely identified with the surface of the natural one.

Or if two inflamed surfaces are in contact, the layer of new connective tissue becomes a permanent bond of union between them, as you see often in the pleuritic, pericardial and other membranous adhesions following attacks of the more sthenic grades of inflammation. When the grade of inflammation is asthenic, the exudation takes place, either into the parenchyma of organs or upon the surface of membranes, in the same manner as just described, and the exudate generally partially solidifies, presenting many of the characteristics of new tissue or membrane, as you may see in the exudations of diphtheria. But its organization is never complete, and it soon disintegrates and disappears, often accompanied by softening or ulceration of the inflamed structure.

Suppuration or the formation of pus, may result from any grade or variety of inflammation, and will occur whenever the exudation in any given case is sufficiently copious to crowd either the white corpuscles of the blood or the proliferating connective tissue cells beyond the influence of the properties inherent in the living organized structure. In the most active sthenic grade of inflammation where the blood is plastic, and both properties of structure exalted, giving to the exudate a strong tendency to organization, you can readily conceive that in the central parts of the inflamed portion of structure where many of the capillaries are completely blocked up by the accumulated corpuscular elements, the amount of exudation might so distend some of the interstitial spaces as to leave more or less of the leucocytes and other cell elements beyond the vitalizing influence of the living fibres bounding such interstitial spaces. The cells and corpuscles thus placed, immediately commence undergoing degeneration, and generally assume the form of pus corpuscles, and mark the beginning of the suppurative process.

While these points of suppuration are being formed in the more intensely engorged central parts of the inflamed structure, in the less engorged parts toward the circumference, the whole amount of the exudate retains its integrity, simply causing increased bulk, density, redness and heat. The central points of suppuration soon unite, forming an abscess, bounded by the denser part of the tissue, thus constituting the typical phlegmonous abscess of the older writers, whose *plastic lymph* meant the same thing as the exudate or plasma, with its leucocytes, proliferating cells, etc., of the histologists of our time.

In the asthenic grades of inflammation, with the properties of the structure impaired, and the exudative material diminished in its plasticity, if the amount of the latter proves sufficient to so far distend the interstitial spaces as to crowd the white corpuscles and cell elements beyond the vitalizing influence of the tissue properties, they suffer purulent degeneration still more rapidly than in the cases just described. And as no part of the exudate becomes more than partially organized, the points of purulent degeneration are not limited or circumscribed by dense tissue, as in the sthenic or phlegmonous variety, but multiply rapidly throughout the whole of the inflamed structure, constituting what is called diffuse suppuration, and often involving extensive softening or destruction of the part.

In the specific inflammations, or those caused by the presence of some special poison in the blood, if suppuration takes place, it will be either circumscribed or diffuse according to the nature of the poison, and the previous constitutional condition of the patient. Some of the specific poisons excite inflammations that are always accompanied by suppuration. Such is the poison of variola and vaccinia, each cutaneous pustule they produce being a miniature phlegmon.

The inflammations caused by others are accompanied by suppuration only in cases of unusual severity, and then the suppurative process is generally diffuse. Such are the poisons causing scarlatina, measles, diphtheria, and erysipelas; while the inflammations of gout and rheumatism seldom present any degree of purulent formation.

Gangrene.—Death of more or less of the inflamed part, or gangrene, was mentioned as a fourth result of the inflammatory process.

In the ordinary sthenic and asthenic grades of inflammation, gangrene or loss of vitality in the structure, is caused by simply increasing the same conditions that give rise to suppuration. The exudation is not only copious enough to overdistend some of the insterstitial spaces, and produce stasis in some of the capillaries, but to completely arrest the circulation of blood in a portion of the inflamed structure. Such complete arrest of circulation is necessarily followed by the cessation of all molecular change, and consequently the cessation of life in the part. It is probable that in some of the inflammations caused by specific poisons of the more virulent class, gangrene may be owing, in part at least, to the direct action of the poison on the properties of the tissue, diminishing the susceptibility and so far diverting the affinity as to arrest all nutritive or molecular changes. In speaking thus far of the results of inflammation I have omitted to mention that when membranes are the seat of the disease, much of the exudate is from the watery element of the blood, and consists chiefly of water holding in solution a small proportion of albumen and saline constituents, and sometimes the red corpuscles of the blood. When the mucous membranes are inflamed, their surfaces having free outlets, the exudate passes off in the form of evacuations, composed of either water, mucus, blood, or pus, and not unfrequently of all these mixed in different proportions at different stages in the progress of the case. When the serous membranes are affected, the liquid part of the exudate is more largely composed of water, with only a small proportion of albumen, and as these membranes are shut sacs, the fluid accumulates, distending the sac, or pressing injuriously upon the contained viscera, as the lungs, heart or brain. These cases are more frequently called effusions than exudations, and the accumulations are called dropsies. Inflammation in any of the membranes may also terminate in suppuration by the same process that I have already described, only the pus will appear principally upon the surface of the membrane involved, and in the shut sacs accumulate like the serous fluids and is often mixed with them. From the analytical review I have now given, you have seen that the morbid process called inflammation, like that of fever, always involves at its beginning certain elements or factors, some of which are constant, and others subject to such variations as to cause material alterations in the progress and results of different cases. There is a oneness or unity in all inflammations, inasmuch as they all involve the same elements or factors at the beginning, but a wide diversity in the progress and results of different cases, on account of the variable condition of two of the primary factors, as well as the diverse character of the remote and exciting causes. You have seen also that all the varieties of inflammation when uninterfered with, pass through the same stages, namely, that of tissue irritability and vascular engorgement, that of exudation, and that of decline. The first, the same in kind in all cases, varying only in the degree of intensity. The second varying much both in regard to the quantity and quality of the exudate. And the third still more variant both in regard to the character of the changes that accompany it, and the ultimate results. I thus restate, in explicit language, the points of unity and the lines of divergence seen in studying the pathology of all varieties of in

flammation, and the distinct stages which mark their progress, because I deem a clear recognition of them of the greatest practical importance at the bedside of the sick. In the first stage, I recognize the co-equal importance of the quantity and quality of the blood, and of the disturbed properties of the tissues by which the molecular changes and tonicity of the vessels are regulated; in the second, of the combined influence of blood pressure on overdistended and partially obstructed vessels and capillaries, and of the altered affinity or attraction between the tissue elements and those of the blood, in determining the amount and rapidity of the exudation; and in the third, of the mutual influence of the tissue properties, and of he amount and quality of exudative material, in determining whether the result will be resolution, new tissue evolution, suppuration or gangrene. By so doing I hope to guard you against the extreme views of Hunter and his followers, who place all the essential pathological phenomena of inflammation in the blood and the blood vessels; and till more against the partial and narrow views of Virchow, Hughes, Bennett, and their followers, who would have us regard the inflammatory process as essentially one of simple cell irritation and proliferation. I would not have you neglect or undervalue the important additions made to our knowledge concerning the histological changes in the development and progress of inflammation by such men as Virchow, Waller, Recklinghausen, Conheim, etc.; but I would have you fully aware of that trait in the human mind which disposes it to magnify the importance, and unduly extend the application of each new discovery it makes, and as physicians, whose primary object is the prevention and alleviation of human suffering, I would have you careful to avoid conclusions based on only a part of the facts belonging to any question or case, and to bring every man's theories to the test of impartial clinical as well as dead house observations.

As you have already noticed, inflammation is not a simple uniform morbid process; consequently when you have decided that a patient is laboring under an attack of inflammation in some organ or structure, you have not completed your diagnosis. A more delicate and equally important task still remains; namely, to judge accurately of the special character of the inflammation by appreciating clearly the quality of the patient's blood, the condition of the elementary properties of his tissues, and the nature of the causes which have been efficient in determining the attack.

Principles of Treatment.—From the views I have presented concerning the nature and tendencies of the different grades of inflammation, you see clearly the futility of all the great controversies that have been had (and they are many) concerning the treatment of inflammation on the theory that it is a uniform morbid process. To claim that all inflammations must be treated antiphlogistically, by depletion, sedatives, evacuants and low diet; or by stimulants, tonics, and nourishment; or by simple rest, mild diet, and patience; is equally unphilosophical and almost equally injurious to a large part of the patients. Either of these methods would succeed in some cases and signally fail in others. And yet there is too much of the old idea still lingering in the minds of the profession, that inflammation is a specific and uniform morbid process, and all you have to do is to determine its existence and location and then treat it according to the general routine. There are, however, certain leading objects to be accomplished in the treatment of all inflammations whether sthenic, asthenic, or specific. These are founded on the pathological conditions existing in each stage of the inflammatory process, and may be placed in tabular form on the blackboard as follows:

INDICATIONS FOR TREATMENT IN ALL INFLAMMATIONS.

- 1st Stage.
  - *a* To diminish the susceptibility or irritability of the structure, and correct the vital affinity.
  - *b*. To relieve the vascular fullness or accumulation of blood.
- 2d Stage.
  - *a*. To limit the amount of exudation, and lessen the general fever.
  - *b*. To prevent the injurious accumulation of effete material from the interference with excretory functions, by promoting eliminations.
- 3d Stage.
  - *a*. To promote the removal of the exudate by resolution.
  - *b*. To sustain the functions of nutrition and excretion.
  - *c*. To promote the repair of structures injured, either by suppuration, gangrene, sclerosis, or atrophy.

While the indications to be fulfilled or objects to be accomplished in each stage of the inflammatory process are the same as just stated in all cases, the *means* appropriate for fulfilling them will vary with each variation in the grade of the disease; and to some extent also, with the differences in the structure and function of the parts involved. For example: in the first stage of the sthenic grade of the disease, the chief agents for correcting the properties of the inflamed structure are anodynes and nervous sedatives, and for relieving the vascular fullness or accumulation of blood, direct depletion and vascular sedatives. In the same stage of the asthenic grade, direct depletion must be omitted and the nervous and vascular sedatives must give place to tonics, especially of the vasomotor class and such as sustain the vital affinity or molecular action in the structures involved. And in the corresponding stage of the specific grades, the leading remedies are such as will suspend the further action of the specific cause by neutralizing (antiseptics) or expelling (eliminants) such cause, aided by anodynes, and either sedatives or tonics, according to the condition of the vascular and nervous functions in each case. The relative importance of the two leading indications to be fulfilled in the treatment of the first stage of inflammation, will depend much upon the anatomical character and function of the part affected. If the structure is dense and but little vascular, like the cartilages, ligaments, periosteum, and some of the serous membranes, the amount of tumefaction or exudation will seldom be sufficient to suspend any function essential to life. Consequently in all such cases you can properly depend much more upon those measures designed to reduce the morbid excitement or irritation of the structure, than upon those aimed at the lessening of the amount of blood in the vessels of the part. If the structure involved be highly vascular and the connective tissue yielding, as in the parenchyma of the lungs, spleen, liver, brain, etc., and the function of the part such that its interruption, temporarily, may directly or indirectly endanger life, then early relief to the vascular fullness is of paramount importance as the chief means for limiting the amount of exudation or effusion. In such cases the means for lessening the accumulation of blood in the part must take the precedence of all others. The complete fulfillment of either of the objects I have named in the first stage will render the disease abortive, and the same result will be reached still more certainly, by judiciously directing the means for accomplishing both at the same time.

The accomplishment of the first object named as desirable in the second stage of inflammation, will be best effected by continuing the use of the same remedial agents that have been mentioned as applicable in the first stage.

The means for accomplishing the object marked *b*, in the second stage, must depend much upon the particular excretory functions interfered with in any given case. Diaphoretics, diuretics, mild laxatives and alteratives or excitors of glandular secretions generally, will all be found applicable in different cases, according to the seat of the disease.

The three indications named as belonging to the third stage of the inflammatory process, will be best fulfilled by a moderate continuance of the remedies required in the second stage, aided by close attention to nourishment, good air, and such tonics as promote assimilation and nutrition.

So far as the limits of a single hour will permit, I have given you an analytical view of the essential pathology, modes of progress, and results of inflammation ; and the general principles that should govern its treatment. Your careful attention to this general consideration of the subject will greatly facilitate your study of inflammations of the individual organs or structures, and enable me to economize time by avoiding repetitions.

LECTURE XXXIV.

Inflammation of the Brain and Spinal Cord and their Meninges—The structures involved and their Anatomical Characteristics—Subdivisions and Names Applied to Inflammation of each Part—Their Clinical History or Symptoms, and Diagnosis.

GENTLEMEN : By the brain, spinal cord and their meninges, I mean the masses of nerve matter called cerebrum, cerebellum, medulla oblongata, and spinal cord, with their three investing membranes, called dura mater, arachnoid, and pia mater. The nerve masses are soft, inelastic, minutely vascular, and so delicate in structural arrangement as to be easily injured, were they not protected by complete inclosure within the bones of the cranium and spinal column. The outer membrane or dura mater is thick and dense, with little vascularity. The second, or arachnoid, is very thin and delicate, only moderately vascular, and like the outer one, spread over the convolutions and surface of the brain and cord, with only slight attachments to them. The inner membrane, or pia mater, is also thin and delicate in structure, but very vascular and by its vessels closely connected with the surface of the brain, dipping deeply down between the convolutions, and extending into the lateral ventricles.

I remind you of these simple anatomical facts because they have some relation to the changes that may be expected to take place during the progress of an active inflammation, as I explained in the preceding lecture. Inflammation may attack either of the membranes separately, or either of the anatomical divisions of the nerve matter ; or it may invade the whole at once. Clinical observations, however, have shown that the dura mater is rarely attacked, except as a secondary or remote effect of syphilis and alcoholism, or as a complication of inflammations of the middle ear, or as a chronic affection of old age. Neither is the arachnoid often

attacked, except in children of scrofulous or tuberculous tendencies, or as a result of the actual deposit of more or less of the gray, miliary tubercle. The pia mater is generally the primary seat of ordinary attacks of acute and subacute inflammation, both in children and adults. From its close vascular connection with the surface of the brain, the latter almost uniformly becomes also immediately involved in the inflammatory process. Practically, therefore, inflammation of the pia mater and convolutions or surface of the nerve masses is one disease. Inflammation of all grades may occur in the interior of either division of the brain or in the cord, without involving the surface, although such cases are not of frequent occurrence. When inflammation attacks the brain and its investing membranes generally, it is properly called *encephalitis*. When it attacks the membranes alone it is called *meningitis*, or the brain structure alone, it is *cerebritis*. As I have already explained, however, meningitis as it affects the pia mater, cannot be clinically separated from inflammation of the convolutions of the brain. Consequently in the further discussion of this subject I shall use the word pachymeningitis to indicate inflammation of the dura mater; meningitis, to indicate inflammation of the arachnoid and pia mater and surface of the brain together, and cerebritis to indicate the disease when it involves the interior of the brain alone. For convenience of description, I shall adopt the following nomenclature: pachymeningitis, meningitis, tuberculous meningitis, cerebritis, cerebral sclerosis, cerebro-spinal meningitis, sporadic and epidemic; spinal meningitis, and myelitis.

Pachymeningitis.—As I have already stated, the dura mater is seldom the seat of simple acute inflammation as a primary affection, but is often involved as the result of blows, mechanical injuries, and surgical operations, affecting the bones of the cranium. Such cases, however belong to the department of surgery, and are fully considered in surgical works, and in the courses of instruction in that department of this and other medical colleges.

Chronic inflammation is more frequently observed in connection with certain constitutional impairments or diatheses, and is often difficult of diagnosis, and still more difficult to remove by remedial management. As the dura mater is composed of two layers, the outer one attached to the inner surface of the cranial bones, like ordinary periosteum, and the inner one presenting a smooth, free surface, covered with epithelium, most observers have described the existence of inflammation in the first as pachymeningitis externa; and in the second as pachymeningitis interna. If we omit the traumatic cases as belonging to surgery, nearly all of those classed as belonging to the outer layer have been found in connection with the cerebral atrophy of old age. Many of these had presented no symptoms during the life of the patient, while others had been characterized by long continued, dull pain in the head, a creeping or crawling sensation in the pericranium, and sometimes in different parts of the cutaneous surface of the body or extremities; general impairment of strength and steadiness in the voluntary muscular system; in some cases morbid wakefulness, and in others almost constant drowsiness; and very generally impairment of the special senses, and of memory.

The morbid anatomy of these cases consists essentially in sclerosis, or thickening of the fibrous structure of the dura mater, with closer adhesions to the bones of the cranium than natural, and in some cases, the deposit of granules or nodules of bony matter, called osteophytes, analogous to the deposits sometimes found in cases of old periostitis of the long bones. It is proper to state that in nearly all these cases called external chronic pachymeningitis, the post mortems show, in addition to the changes

in the dura mater, more or less of the general cerebral atrophy peculiar to old age. And it is hardly proper to regard those cases which have presented no symptoms during life, and after death show only slight increased adhesions of the dura mater to the bone, with here and there an osseous granule, as in any degree inflammatory. They clearly belong rather to the series of changes dependent on the impairments and perversions of nutrition consequent on old age, instead of on any degree of inflammatory action.

Under the head of pachymeningitis interna, writers have included a variety of cases which have occurred chiefly in persons habitually addicted to the use of alcoholic drinks, or affected with the general paralysis of the insane, or with constitutional syphilis, or undergoing the degenerations of old age. Sometimes the changes in the dura mater have been traced to the influence of blows, or mechanical injuries of the head. As might be expected from the statement just made, far the larger proportion of cases occur in persons past the middle period of life, and much more frequently in males than in females.

The symptoms and clinical history of the cases reported by different observers vary so much that it is difficult to specify such features as are reliably diagnostic of the disease. I think this arises mainly from the fact that writers have included under this head many cases of hæmorrhage from the inner surface of the dura mater caused by changes that are not really of an inflammatory character, and many other cases which were associated with such coincident affections of the brain as to render it impracticable to separate or recognize the symptoms of the meningeal disease. Of this latter character were cases II and IV, as reported by Dr. C. L. Dana, in the *Journal of Mental and Nervous Diseases*, for January, 1882. Of the former class I regard some of the cases reported by Huguenin, whose field of observation was largely among those affected with the general paralysis of the insane.*

My own clinical observations incline me to believe that all cases of an inflammatory character in the early stage are characterized by frequent pains in the head, accompanied by morbid sensations of heat over the top of the head, much increased by exposure to the sun; more or less vertigo, or rather a feeling of insecurity in walking or making quick movements; various morbid sensations over limited areas of the cutaneous surface, both of the trunk and extremities; and disturbed sleep.

As the disease advances, the headaches are frequently accompanied by tinnitus or buzzing in the ears; mental stupor, or somnolence, accompanied by partial paralysis, or at least greater impairment of muscular action; sometimes muscular twitchings, or temporary periods of rigidity, or even epileptiform convulsions.

After the disease is well established, one of the most characteristic features is the occasional sudden supervention of periods of profound somnolence, lasting from a few hours to one or two days, then passing off, leaving the patient weak, but the mind clear, though sometimes a little difficult to give expression to the thoughts, or to command ready co-ordination of muscular movements. Occasionally it will happen that the period of somnolence will be replaced by a paroxysm of incoherent talkativeness and excitement. Ultimately the mental faculties become more constantly impaired, with imperfect control over the sphincters of the bladder and rectum, ending in general paralysis and death. Some of the cases terminate more abruptly by the sudden supervention of profound coma, dilation of the pupils, involuntary discharges, slow and intermitting

* See Ziemssen's Cyclopædia, Vol. xii, p. 385.

pulse, cold extremities, and death in from one to thirty-six hours after the coma commences. Two well marked cases of this kind have recently come under my own observation. During all the earlier part of the disease, there will be temporary periods of slight pyrexia, accompanied by loss of appetite, general impairment of secretory actions, and more severe headaches.

But most of the time the temperature is not higher than natural, and the patient takes food and drink readily. During the paroxysms of somnolence the pupils are generally much dilated, or one is largely dilated while the other is contracted, and I recollect one case in which the pupils became closely contracted while the patient was in the paroxysm of stupor, with the lids closed, but when the lids were separated, and efforts made to arouse the patient, they became rapidly and fully dilated.

Diagnosis.—If the peculiarly variable train of symptoms I have detailed are observed in a patient previously long addicted to free use of alcoholic drinks, or long subject to insanity or hemiplegia, or presenting indications of degeneration from old age, you may safely infer the existence of true pachymeningitis interna. It is only by including under this head cases of meningeal hæmorrhage from cerebral atrophy alone, atheromatous or fatty degeneration of the coats of the vessels, and other pathological conditions, unaccompanied by any degree of inflammation, that the diagnosis becomes difficult and uncertain.

Special Pathological Changes.—The changes which are regarded as specially characteristic of this form of disease are the formation of a delicate and highly vascular layer of membrane or organized structure on the inner surface of limited portions of the dura mater, chiefly along either side of the longitudinal sinus and falx cerebri, and sometimes extending in patches over most of the parietal regions; and more or less indications of hæmorrhages, in connection with the membranous formation. The membranous patches are at first very thin and easily overlooked, often appearing like a slightly yellowish stain on the surface of the dura mater. Examined under a magnifying power they are found to consist principally of blood vessels with extremely thin walls and varicosities, with very little fibrous or connective tissue. The larger patches also very generally present evidences of small hæmorrhages from the vessels, the serum of which had been absorbed leaving the stain of coloring matter and some shreds of fibrin adherent to the membrane. It is these repeated small hemorrhages that cau e the paroxysms of temporary somnolence, contraction of the pupils, and partial paralysis, which mark the progress of these cases.

In some instances the hemorrhages are more copious causing either hemiplegia or apoplexy which may prove speedily fatal, or from which the patient may slowly make a partial recovery. The new membranous patches together with the adhering debris of the blood clots are called *hæmatomæ* and many of them are sufficiently thick to press injuriously upon the convolutions of the brain, and sometimes to present slight adhesions to the arachnoid and pia mater.

As a large proportion of the cases of pachymeningitis occur in patients already undergoing more or less cerebral atrophy, it is highly probable that the patches on the surface of the dura mater consisting primarily of delicate vessels with thin walls and many varicosities, result directly from the diminished pressure on the surface of the membrane, for as the mass of the brain shrinks, the bones to which the dura mater adheres cannot follow the shrinkage. Consequently, there will be less pressure on the free surface, and a corresponding tendency to distension of, and exudation and even hemorrhage from the capillaries and smaller vessels, without the intervention of

any true inflammatory process. In such cases the views of Huguenin, who denies this inflammatory nature, are more nearly correct than those of Virchow and his followers, who regard all the patches as originating in inflammatory exudations.

Prognosis.—The form of disease under consideration, occurring usually in connection with impaired constitutional conditions that are often permanent, has no natural tendency to recovery and is not generally cured by remedial agents. Neither is there any natural limit to the duration of the disease. It may terminate early and suddenly from copious hemorrhage and fatal compression of the brain, or it may continue for several years.

Treatment.—The treatment must consist in removing as far as possible all causes of mental and cerebral excitement, in improving whatever constitutional impairment may exist in each case, and in the use of such remedies as are supposed to increase the tone and contraction of the meningeal vessels, in the hope of lessening the size and fullness of the vessels composing the membranous patches or hæmatomæ, and thereby retard their growth and lessen the danger of hemorrhage. Perhaps no remedies do this more reliably than ergotine aided by digitalis when the cardiac action is quick and weak, and by strychnine and iron when it is slow and irregular with anæmia or impoverishment of the blood. The proper adjustment of diet and exercise to the general constitutional condition of the patient; the entire prohibition of the use of any kind of alcoholic drinks, tobacco, and all other agents that exert an anæsthetic or paralyzing influence on the vasomotor nerve functions; and the judicious use of such remedies as I have just mentioned will constitute the best treatment both for retarding or arresting the progress of the meningeal disease, and preventing the frequent hemorrhages to which these cases are liable. When such hemorrhages do occur, it may be necessary to add, temporarily, the use of mild evacuants, and moderate doses of iodide of potassium, to hasten the re-absorption of the serous part of the effused blood and thereby lessen the pressure upon the brain. In such cases as have a manifest syphilitic constitutional taint, the more persistent use of the iodides aided by the occasional use of mercurial alteratives will be beneficial.

Meningitis.—As I have already stated, by meningitis I mean inflammation of the pia mater and convolutions of the brain. The grade of inflammation may be either acute, subacute, or chronic. It may involve the whole extent of the membrane and surface of both hemispheres, or it may be limited to one hemisphere, or even to a circumscribed part extending over only a few convolutions. It occurs much more frequently in children under five years of age than in adults.

Causes.—Among the more important predisposing causes, are, the greater vascularity and less maturity of structure in early childhood; the greater excitability and less tonicity characteristic of the scrofulous and tuberculous diatheses; habitual excess of mental exercise and confinement in-doors; protracted mental anxiety with deficient sleep, and the free use of rich and highly seasoned food with what are called stimulating drinks.

The more immediate exciting causes, are, exposure to the extremes of heat and cold; sudden and intense mental emotions and passions; intense and protracted mental exercises of any kind; the deposit of gray miliary tubercular granules; and the presence in the blood of irritative material whether in the form of retained excretory products derived from the natural tissue changes, or of toxemic agents imbibed from without.

Symptoms, or Clinical History.—Simple acute meningitis usually commences rather suddenly, though it may be preceded several days by some

headache, vertigo, flushed face, with starting and restlessness at night. At the actual beginning of the inflammation the pain in the head becomes intense, often, particularly in children, accompanied by a few minutes of paleness of the features and sudden ejection of the contents of the stomach by vomiting. This is quickly followed by general febrile action, characterized by flush of the face, congestion of the vessels of the conjunctiva, contraction of the pupils, distracting pain and undue heat in the head, fullness and tension of the carotid and temporal arteries, pulse full and frequent, respiration hurried, mind excited and generally more or less delirious, sometimes wildly so, urine scanty and high-colored, and bowels inactive. In children under five years of age this stage is in many cases ushered in by one or two general convulsions, followed by the assemblage of symptoms just detailed. And when convulsions do not occur in young children, the intense pain and delirium are indicated by sudden startings, screechings, biting of the fingers, or whatever is put into their mouths, pulling of their hair, and reckless tossing from side to side. In all cases of acute meningitis the temperature of the head and body rises rapidly, and usually ranges during the stage of excitement between 39° and 40.5° C. (102° and 105° F.) in the axilla. After a period, varying from twelve or eighteen hours to three or four days, the symptoms begin to change. The symptoms indicating pain in the head and mental excitement diminish, the temperature falls one or two degrees; the pulse is softer and a little unsteady, the pupils vacillate, being sometimes contracted and in a few minutes dilated, or more frequently one pupil dilates while the other remains small; and the patient has brief periods of apparent sleep, and is noticed to be much less sensitive to light and noise.

On the supervention of these symptoms or rather abatement of the previous symptoms, the friends and sometimes the attending physician are greatly encouraged, thinking the patient better. But in twelve or eighteen hours more, it is found that the periods of apparent sleep have deepened into stupor; with soft, weak, irregular pulse; unsteady and inefficient respiratory movements; dilated pupils and strabismus or divergence of one or both eyes; cool extremities; and difficulty of deglutition. In young children, the stage of transition from high excitement to that of stupor and depression, is in many of the cases, marked by the occurrence of general convulsions, followed speedily by coma, paralysis, involuntary discharges and death. And in cases not marked by convulsions, whether in children or adults, the stupor gradually deepens into profound coma; the respirations become very slow or interrupted; the pulse small and frequent; the eyelids only partially closed; the pupils widely dilated and deglutition suspended; followed by general paralysis and death. There are thus three distinct periods or stages in the progress of each case that proceeds to a fatal result. The first is the stage of high irritative excitement, lasting, as I have already said, from eighteen hours to three or four days. The second is the period of transition from high excitement to stupor and depression, and is of much clinical importance as marking the commencement of exudation and effusion from the previously inflamed and over-distended vessels; and usually lasts from twelve to twenty-four hours. The third stage is that in which the inflammatory products, consisting of a serous or seropurulent fluid, with some fibrinous material, has accumulated in sufficient quantity to compress the brain and impair or overwhelm its functions, and varies in its duration from a few hours to five or six days, depending upon the rapidity and extent of the exudation. In the milder class of cases, and in such as are favorably modified by early and active treatment, the first stage is generally longer, but the symptoms of excitement are less severe, and the

vascular fullness subsides with so little exudation or effusion that convalescence follows instead of the third, or stage of depression. You are liable to meet with a class of cases, chiefly in children under ten years of age, in which the symptoms preceding and accompanying the first stage are more obscure and much more liable to be misunderstood. In this class of cases, the child first begins to look sad or dejected; has a variable or capricious appetite; is restless or frequently starts or cries out in his sleep; pulse a little accelerated in frequency; temperature from one to two degrees higher than natural, more particularly in the afternoon and evening, but looks pale in the morning with but little disposition to exercise, and sometimes promptly rejects by vomiting whatever is first taken into the stomach in the morning. The bowels are usually costive, but in the summer season there is in most of the patients frequent turns of moderate diarrhœa with a very variable condition and color of the discharges. After one or two weeks of these variable and apparently mild symptoms, during which the child is usually dressed and up more or less every day, there comes, in some of the cases, suddenly one or more general convulsions, which are followed by more fever, more signs of pain in the head, more contraction of the pupils, more gastric irritability, a more frequent and somewhat variable pulse, and indisposition or inability to assume the upright position for more than a few seconds at a time.

In perhaps a majority of the cases the same increase or exaggeration of the symptoms takes place without the occurrence of general convulsions. After continuing with but little variation in the character of the symptoms, except a steady increase in the loss of flesh and strength, from one to two weeks after confinement to the bed, the patient begins to appear more dull and difficult to arouse; one or both pupils are observed to be larger than natural and the eye turned from its natural position, and in one or two days more all the symptoms I have mentioned as indicating the accumulation of inflammatory products sufficient to produce cerebral compression, coma, paralysis, and death. Many of this class of cases are entirely misunderstood in all the earlier part of their progress, and their symptoms attributed to teething, worms, gastro-intestinal irritation, or infantile remittent fever; their true character not being suspected until either convulsions or the symptoms of direct cerebral compression have supervened.

Scrofulous or Tubercular Meningitis.—The last cases described may be regarded as occupying an intermediate relation, or as forming a connecting link between the ordinary form of acute meningitis and that which occurs in connection with a strongly scrofulous diathesis or an actual tubercular deposit in the membranes and surface of the brain. The latter class of cases was recognized and described by the older writers under the names of acute and chronic hydrocephalus. This name was suggested by the fact that post mortem examinations very uniformly showed a large amount of serous fluid on the exterior surface of the pia mater, and often extending into the lateral ventricles; and the presence of the small, gray, or miliary tubercles in the arachnoid, pia mater, and cerebral convolutions was not recognized until a later period.

The symptoms in many of the cases belonging to this class are at first obscure and very variable. They are most apt to be manifested between the ages of one and seven years; yet they have been met with at all periods of life. In the great majority of cases the earliest symptoms are frequent turns of headache, accompanied by slight fever, and sometimes vomiting; restlessness at night, manifested by startings, crying out in sleep, and frightful dreams; gradual loss of flesh, with variable appetite and moderate consti-

pation, the latter occasionally interrupted by a day of diarrhœa; and generally paleness, with a sad expression of countenance in the morning, followed by more color and cheerfulness in the afternoon, with slight acceleration of pulse, and a rise of one or two degrees in temperature. These symptoms are usually noticed more or less for several weeks, and in some cases three or four months, when suddenly without any known cause, the little patient is seized with a general convulsion, which may be repeated at short intervals two or three times, or may occur but once. This is followed by a more continuous moderate grade of fever, with headache, some contraction of the pupils, inability to be up, indisposition to talk except when directly questioned, little or no appetite, often vertigo and disposition to vomit when the head and trunk are raised to an upright position; pulse and respiration are variable, generally increased in frequency whenever the patient is disturbed, but slower and occasionally intermitting when quiet in a recumbent position. In from five to seven days after the patient is compelled to remain in bed, he becomes more dull and somnolent, his pupils more dilated, and often the neck stiff, or the head turned to one side; the pulse weaker and more frequent, respiratory movements feeble with an occasional sigh, deglutition impaired, bowels inactive, and abdomen apparently empty, there being neither distension nor tympanitis. In the early part of this stage, the patient can be aroused by shaking or sharp questioning sufficient to recognize those speaking to him and answer in monosyllables; but if the answer requires the use of sentences, he will generally lose the thought, and leave the sentence unfinished. The supervention of these symptoms indicate the commencement of serous effusion and consequent pressure upon the surface and the lateral ventricles of the brain. The symptoms resulting from such pressure usually increase from day to day, until consciousness is entirely lost; the discharges involuntary; the limbs motionless; the eyelids only half closed; pupils widely dilated, and the exposed surface of eyeballs dry, with a little muco-purulent or opaque matter in the inner angle; pulse small, weak, and variable in frequency; respiratory movements extremely feeble, with an occasional interruption, followed by a sigh or deeper inspiration; and no attempt at deglutition. In from one to four or five days after the development of these symptoms, a little coarse mucous rattle is heard in the trachea and larger bronchial tubes for a few hours, when generally one or two slight convulsive shudders run through the muscular system, the chin drops, the tongue falls back in the mouth, a few feeble gasps for breath, and life is extinct. Such is the most common course of the disease as met with in children between the ages of one and seven years. It is subject, however, to many variations. I have seen children of a strong hereditary tubercular diathesis, who were subject to periods two or three times a year, lasting two or three weeks at a time, during which they would present all the premonitory symptoms I have just detailed, including one or more convulsive paroxysms, yet so far recover as to appear bright and quite well in the interval. In almost all cases, however, the symptoms of the second, followed by those of the third stage, came on before the end of the second year. These illustrate the more chronic form of the disease. On the other hand, I have seen cases so rapid that after the symptoms of disturbed sleep, sudden startings, with moderate gastric and intestinal disturbances had lasted but two or three days, more continuous fever supervened accompanied by drowsiness, inattention, variable pulse and respiration, with first contracted and subsequently dilated pupils, and all the symptoms of cerebral pressure increasing so rapidly as to prove fatal in from five to seven days from the first appearance of

symptoms sufficient to attract attention. In adults and children over ten years of age, the disease is less frequently accompanied by convulsions during any stage of its progress, and more uniformly continues until a fatal result is reached without intervals of partial recovery. But when the inflammatory action commences in the pia mater before the cranial sutures and fontanelles have closed, these open, allowing the head to enlarge as the effusion accumulates, thereby lessening the direct pressure on the cerebral structure, and thus enabling the patient to live for months and sometimes several years. It is but a few weeks since, that I called your attention to a case of this kind in one of the hospital clinics. The head of the child was increased in both the vertical and transverse diameters, making the top and anterior part of the head look high and broad, with the anterior fontanelles prominent and at least fifty millimeters (two inches) in diameter, while the eye-balls appeared to be crowded a little outward and downward, giving both to the face and head a peculiar and characteristic appearance. That child was eighteen months old, the symptoms of meningitis having commenced at the age of six months. While the head had thus increased in size, the body and extremities were emaciated and the muscles of the neck hardly strong enough to hold the head erect. Neither would its limbs support the weight of its body; and yet it gave evidence of considerable mental activity and intelligence. A few years since I had the opportunity of presenting to the clinical class a girl aged seven years, whose history, as related by her mother, showed an attack of subacute meningitis with one or two convulsions when the child was only two months old; after which the head continued steadily but slowly to increase in size until the time I presented her to the clinical class. At that time the sagital and coronal sutures were wide open, the anterior fontanelle at least seventy-five millimeters (three inches) in diameter, and the whole head enlarged in the same proportion. The eye-balls were prominent and turned obliquely downward, from the depression of the superior orbital plate of the frontal bone, while the small face tapering to the chin contrasted strongly with the broad and high forehead. The body and extremities were emaciated and small, making the head look larger and feel heavier than the whole body. She could move all her limbs, but had not strength to turn her head, much less to lift it from the pillow. When allowed to remain quiet in a strictly horizontal position, she took food and drink when offered to her and manifested some degree of intelligence. But the moment her head was raised up sufficient to bring the pressure of the contained fluid upon the medulla oblongata and parts at the base of the brain, the whole system of voluntary muscles would become tremulous, the circulation and respiration irregular, and unless speedily returned to the horizontal position, more decided convulsive movements ensued. She died in the eighth year of her age.

These cases sufficiently illustrate the course of chronic meningitis commencing in early infancy, whether connected with tubercular deposits or not. The chronic form of the disease occurring at any age after the cranial sutures and fontanelles have closed, if accompanied by serous effusion, must necessarily cause compression of the brain, and its consequences, as I have already described. There is, however, a grade of chronic meningitis that is not accompanied by serous effusion or symptoms of compression, but simple hyperæmia of vessels with plastic deposits and thickening of some portions of the membrane. The early symptoms of such cases are almost constant cephalalgia with sensations of undue heat and fullness in the head, frequent flushing of the face, slight acceleration of the pulse, inability to sleep, undue sensitiveness to light and sound, great mental

excitability, and at a later period more constant mental derangement. This form of meningitis is so closely connected with some of the forms of insanity that its diagnostic symptoms will be more fully considered in connection with that subject.

Cerebritis.—When acute or subacute inflammation attacks the interior portions of the brain without involving the surface or gray matter of the convolutions, the symptoms differ in some respects from those of meningitis. The initial symptoms are generally vertigo, or a disposition to go or fall in a certain direction when in the erect position, accompanied by a disposition to vomit, and in some cases chilliness and cold extremities. These symptoms are followed by general fever and pain in the head, but the former is not as high and the latter is more circumscribed or limited to some one part of the head, than in meningitis. Instead of the intense, throbbing, distracting pain over the whole head, in cerebritis the pain is sharp, often running through the head like a knife, but so limited in space that the patient claims he can cover it with his finger. Instead of early and excited delirium the mind appears dull, taciturn, indisposed to talk, and the patient turns or moves his head with reluctance. In the early stage the pupils are contracted, but not always equally so, and in many instances there is rigidity of some of the muscles of the neck or extremities or hyperæsthesia of the surface. In children the thumbs are sometimes drawn into the palms of the hands and the fingers bent over them from tonic contraction of the muscles of the forearm. More rarely the toes and feet are affected in a similar manner. The temperature seldom rises above 39° C. (102.5° F.); the pulse is small and corded, but very variable in frequency, in some cases being slower than natural and the respirations altered in the same direction. The duration of this first stage varies in different cases from three to seven or nine days, during which time the abdomen appears empty and the bowels decidedly costive. Sooner or later the mind becomes more dull or wandering and difficult to arouse; one or both pupils begin to dilate; the respiration and circulation are more variable and often intermitting; deglutition slow and difficult; the muscles previously rigid become relaxed, constituting paralysis; and the evacuations either become involuntary, or the urine is retained until the bladder is over-distended. In this condition the patient lingers from one to two weeks and dies in an unconscious and paralyzed condition. In the more acute cases the disease will run through its regular stages of intense capillary congestion, exudation and fatal compression in one week, while the subacute cases may occupy from four to six weeks in reaching the same result. You will thus observe that the usual course of cerebritis is slower than that of meningitis, and the accompanying symptoms less violent and in some respects more resembling those of typhoid fever, for which it has been sometimes mistaken. The particular part of the brain involved in the inflammation in any given case is often clearly indicated by the presence of special symptoms. Aphasic symptoms or early loss of speech, points to disease of the inner part of the anterior lobes, or more particularly to the island of Reil. Early derangements of, or loss of vision, indicate disease near the tubercula quadrigemina, while early and prominent disturbances of muscular action, as manifested either in spasms, muscular rigidity, or inco-ordination of movements, point to the cerebellum or medulla oblongata, as the seat of disease.

Cerebral Sclerosis.—There is one more form of inflammation occasionally met with affecting the structure of the brain. Its primary seat is the connective tissue, which under chronic inflammatory irritation becomes hypertrophied and consequently so presses upon the nerve cells and fibres as

to interrupt their nutrition and cause their ultimate disappearance, leaving the texture of the part harder than natural. These cases of disease of the brain are strictly analogous in their pathology to the slow interstitial inflammation that leads to sclerosis of the connective tissue of the lungs, liver, and kidneys, as seen in what some have called fibroid consumption, cirrhosis, and the hard granular kidney. Hence it has been called cerebral sclerosis. This affection is always chronic, and its clinical history extends over several years. I have one case now under observation that has already continued fifteen years; but most of the cases terminate in from five to ten years. The most characteristic symptoms are mental despondency, with impairment of the mental faculties generally, but more in the direction of enfeeblement than of perversion or derangement; a peculiar fixedness of the position of the head in walking, generally leaning it a little forward or to one side, with a slightly tremulous or unsteady condition of the voluntary muscular movements; and as the disease advances, the muscular rigidity or paralysis affects successively different sets of muscles in such order of succession, as to indicate quite clearly the progressive extension of the disease in the cerebral structure. A constant dull pain extending from the occipital to the lower part of the frontal region, through the base of the brain, increased by motion, is a pretty constant accompaniment of the disease; as is also insomnia and great restlessness at night. In the advanced stage of the disease the muscles concerned in speech and deglutition, become so impaired in their action as to render both these acts slow and difficult. And if the patient gains an upright position he is disposed to move in some special direction in spite of his efforts, or if he progresses forward, it is only by a trotting gait with the head and body leaning in that direction.

In most of this class of patients the appetite and general nutrition continue good. Consequently there is little or no emaciation, and in some cases a positive increase of fat and weight. More or less fatty degeneration generally accompanies the pathological changes in the brain, and the mental faculties ultimately become so impaired as to constitute decided dementia; and death finally results from the hæmorrhagic extravasations, causing general paralysis or apoplexy.

Cerebral sclerosis is very generally connected with similar pathological changes in some part of the medulla and spinal cord. Of the symptoms indicating the existence of the latter, I shall speak when considering the inflammations of the cord generally. As the present hour has expired, I must reserve the consideration of the morbid anatomy, diagnosis, and treatment of the different grades of meningitis, cerebritis, and cerebral sclerosis until we meet to-morrow.

LECTURE XXXV.

Inflammation of the Brain, etc., continued—Meningitis, Cerebritis, Cerebral Sclerosis; Their morbid Anatomy, Diagnosis, and Treatment.

GENTLEMEN: At the close of the preceding lecture hour I had completed what was deemed necessary to say concerning the clinical history or symptomatology of the different grades of inflammation affecting the membranes and structure of the brain. As I explained fully when speaking of the general pathology of inflammation, the first stage is

characterized by intense vascular fullness with increased excitability of the inflamed part. In all cases, therefore, in which death has taken place during the first stage of either meningitis or cerebritis, a post mortem examination of the inflamed structures shows complete engorgement of the capillaries and smaller vessels with correspondingly increased redness, and some disturbance of the molecular arrangement of corpuscles and organic atoms, both in the contents and walls of the vessels. When death has taken place during the second or third stage, you find, in addition to the redness and intense vascular fullness, more or less exudation of the contents of the vessels both into the interstitial spaces and upon the surface of the inflamed part. If the case is one of meningitis or inflammation of the pia mater and surface of the convolutions, you will generally find a stratum of serous fluid over the surface of the membrane, in the lateral ventricles, between the convolutions, and to some extent in the interstitial spaces of the gray matter under the membranes.

This serous fluid has escaped from the over distended vessels and contains, besides the water, more or less albumen, shreds of fibrin, white and red corpuscles, and sometimes numerous pus cells. The amount of fluid varies much in different cases. In some of the more active cases in patients with previous plastic blood, numerous patches of thin pseudo-membranous exudation have been found on the surface of the pia mater.

In the tubercular form of meningitis the amount of serous effusion is generally larger than in simple inflammation, but the fibrinous or plastic elements are less. The chief structural peculiarity of these cases, however, is the presence of small gray miliary tubercles chiefly in the pia mater, but often also in the arachnoid and in the gray matter of the cerebral convolutions. They are found in greatest number usually in the membrane covering the under surface of the cerebellum and posterior lobes of the cerebrum, in the fossa Sylvii, and neighboring parts, but are also sometimes found over the cerebral hemispheres, and in the choroid plexus. Many of the granules are very small, but when several are aggregated together they may make a nodule the size of a small pea. Examined under the microscope they are found to consist of lymphoid cells collected in nodules in the walls of the small arteries of the pia mater and surface of the brain. The large granular or giant cell is rarely seen, and appearances of caseous degeneration in the center of these small tubercles is less observable than in tubercular deposits elsewhere. The serous part of the effusion in this class of cases is found mostly under the base of the brain and in the lateral ventricles, and often contains pus cells enough to give it a turbid appearance.

In cerebritis or inflammation of the interior part of the brain, there is a decided tendency to suppuration and the formation of abscesses. In some cases the collections of pus are small and numerous, with the vessels of the surrounding brain structure finely injected with blood and the interstitial spaces crowded with serous fluid containing pus corpuscles, giving it an œdematous and somewhat softened appearance. Small hæmorrhagic exudations into the perivascular sheaths, with broken nerve fibres and fatty degeneration of the ganglion cells, are also observable in most cases. Instead of numerous small abscesses, cases occasionally occur with but one abscess and that of large size.

In all recent cases the walls of the abscess are fringed or shaggy and destitute of a lining membrane. But in more protracted or chronic cases the walls of the abscess are generally lined with a layer of condensed connective tissue somewhat resembling a cyst, and the matter may emit an offensive odor. When death has taken place early, there may be no wel

defined abscesses, but the inflamed structure when cut across, will present numerous points of blood from the engorged vessels, a reddish yellow color of the surface, and some interstitial infiltration of the liquor sanguinis.

In the cerebral sclerosis, the chief pathological changes are, the hyperplasia or increased growth of the connective tissue and the coincident diminution of the nerve cells with more or less fatty degeneration of such cells as remain. This gives greater density or induration to the affected brain structure, instead of softening, as in ordinary cerebritis. The seat of this form of disease is generally in the white or medullary part of the brain, and is very generally confined to particular tracts or bundles of nerve fibres, and may be traced through the medulla down the spinal cord.

Diagnosis.—The diagnosis of simple acute or subacute inflammation of the membranes and surface of the cerebral hemispheres, to which I have applied the name of meningitis, is not difficult. The severe distracting pain and unusual heat in the head, the fullness of the carotid and temporal arteries, the contraction of the pupils, the increased sensibility to light and sound, and the general nervous and mental excitement, constitute an assemblage of symptoms that sufficiently indicate the early stage of this disease; while the subsequent stupor, dilated pupils, variable pulse, sighing respiration, and paralysis, still more strikingly characterize the later stages of its progress.

The milder cases of the subacute and those of the tubercular form, require closer attention to prevent mistakes during the early stage of their progress. The nervous symptoms accompanying these cases, such as sudden startings, crying out in sleep, and even the convulsions, are very often attributed to *teething*, if the patient is under two years of age, and to *worms*, if older.

So, too, the sudden turns of paleness and vomiting, followed by feverishness with the variable condition of the intestinal discharges already described, are attributed either to the same causes or to gastro-intestinal irritation. There is, however, in all these cases of meningeal disease, a continued sadness of expression, a carefulness in the movements of the head, an alteration in the size of the pupils, and a lankness of the abdomen or absence of flatulent distension, that I have never seen in connection with intestinal worms or any other form of gastro-intestinal irritation. It only requires careful and discriminating attention to the history and detail of symptoms in each case to avoid mistakes in the diagnosis, even in the first stage of the disease.

The only disease with which cerebritis has been confounded, is typhoid fever. There is a certain degree of similarity in some of the symptoms, such as the dullness and indisposition to talk freely, the vertigo or unsteadiness of the head in the upright position, and the low grade of fever. But close attention will develop the fact that in the cerebral disease, the pain in the head is more circumscribed and penetrating; one or both pupils are contracted, and the eyes unduly sensitive to light; a disposition is manifested to keep the head in a fixed position, or if moved, to have an inclination to fall in a given direction; the bowels are not only costive, but requiring full doses of cathartic medicines to move them; and the abdomen is free from tympanites or fullness from any cause. These are all reversed in the early stage of typhoid or any other general fever. As the cerebral disease advances, the further alteration of the pupils, the occurrence of rigidity in the muscles of the neck or extremities, the increasing stu or or difficulty of speech, and the continued lankness or retraction of

the abdominal muscles, ought to be regarded as sufficient to remove all doubts concerning the diagnosis. The detail of symptoms I gave in the preceding lecture as accompanying cerebral sclerosis, are sufficiently diagnostic of that form of disease, and need not to be repeated here.

Prognosis.—All cases of inflammation involving either the pia mater, cerebral convolutions, or interior structure of the brain, are more or less dangerous to life. In simple, acute and subacute meningitis, as I described it in the preceding lecture, if the diagnosis is made early, and the treatment promptly and accurately adjusted during the first stage of the inflammatory process, there is a reasonable probability of success in arresting the disease before any considerable amount of exudation or effusion has taken place, and the patient will recover. Such a result has been obtained in many cases under my own observation. If the first stage has passed, and symptoms of effusion or exudation already exist, the prognosis must be regarded as decidedly unfavorable, although occasionally a case may recover by the absorption of the inflammatory products. When meningitis or cerebritis occurs in a patient of decided scrofulous or tuberculous diathesis, and especially if tubercular deposits already exist, it is not probable that a permanent recovery ever takes place.

I have many times seen mild inflammatory attacks in such cases promptly checked by proper treatment, but the disease has always returned, and ultimately proved fatal.

Cerebral sclerosis, when well established, is also uniformly fatal, but in most cases not until after a period of suffering, varying from five to fifteen years.

Treatment.—The delicacy of structure and high degree of vascularity of the brain and its immediately investing membrane, together with the fact that after the early months of infancy the whole is inclosed within the bones of the cranium in such manner as to allow of little or no expansion from increased fullness of blood, makes that element of the first stage of the inflammatory process which I have called hyperæmia or accumulation of blood in the inflamed part, one of paramount importance in the diseases now under consideration. In all the more acute inflammatory attacks, whether involving the membranes or substance of the cerebral hemispheres it is the pressure, first from the over-distended and engorged blood-vessels, and second, from the accumulation of inflammatory products, that constitutes the chief danger to the life of the patient. Consequently, it is of great importance to commence the treatment of all such cases as soon after the commencement of the attack as possible, and to use such remedies promptly as will be most efficient in lessening the accumulation of blood in the part. By so doing we shall not only lessen the danger of fatal pressure from the direct engorgement of vessels, but we shall most effectually limit the amount of inflammatory products in the form of exudations and effusions. For it matters not, gentlemen, what theory of inflammation you adopt, the clinical fact remains that you get no inflammatory products, whether in the form of cell-proliferation, migrating corpuscles or leucocytes, micrococci, or exuded liquor sanguinis, until you first have undue vascular fullness or accumulation of blood and irritation of structure; and the additional fact that the further accumulation of such products ceases as soon as the vascular fullness is removed. Therefore I repeat with emphasis, that the leading object to be accomplished in the treatment of the first stage of cerebral inflammation is to relieve the undue accumulation of blood before a dangerous degree of exudation has taken place, and so far as may be practicable to coincidently lessen the morbid excitability of structure. If you succeed fully in accomplishing this ob-

ject you prevent the second stage, and it is only necessary to continue those measures that are calculated to lessen irritability and prevent a renewal of blood accumulation, for a few days, and convalescence will be established. If, however, the effort to relieve the hyperæmia of the first stage has been only partially successful, and the second stage accompanied by more or less exudation, whether plastic or serous, has supervened, then the principal objects to be accomplished by further treatment, are, to sustain the patient and hasten as far as possible the removal of the exudative products by disintegration and re-absorption.

I state thus distinctly the objects desirable to accomplish in the treatment of the successive stages of both meningitis and cerebritis, because they are founded on the nature of the inflammatory process and the anatomical characteristics of the structures involved, and will always remain the same. The relative value of the therapeutic agents designed to accomplish any given object, may change with every addition to our knowledge of new remedies or of the *modus operandi* of old ones, but the object itself will still remain.

In addition to a definite knowledge of the objects to be accomplished, it is desirable that you have an equally clear comprehension of the modes by which they may be effected. For instance, the accomplishment of the first object I have named, may be reached either by the use of remedies that reduce the force and frequency of the action of the heart, and thereby lessen the quantity of blood sent to the inflamed part in a given time; or by the removal of a quantity of the blood itself sufficient to lessen the general fullness, as by venesection and leeches; and by such as are capable of inducing contraction of the hyperæmic vessels themselves. In other words the amount of blood in the vessels and capillaries of a part, may be influenced by cardiac sedatives, direct depletion, and vasomotor excitants or tonics. The relative value and applicability of each of these classes of remedies in any given case must depend upon the special character of the inflammation as influenced by the quality of the blood and the elementary properties of the structure involved. In acute active inflammation of the membranes and structure of the brain, in subjects not previously debilitated by specific causes, the prompt abstraction of a liberal quantity of blood by one free bleeding in adults and by leeches in children, aided by the judicious use of cardiac sedatives, is by far the most efficient mode of checking or arresting the inflammatory process in its first stage, that can be devised. That many of the milder class of cases can be controlled by the sedatives without the loss of blood has been proved by clinical eperience.

But in my estimation the same kind of experience has equally proved that in the more acute and active cases the danger to the life of the paixent is greatly increased by such omission. Bleeding should be resorted to only during the stage of active excitement, before any symptoms of exudation or effusion are manifest. Elevate the head and shoulders of your patient a little, cord the arm and make an opening in the vein sufficient to allow the blood to flow in a free stream, and let the flow continue until the pulse becomes soft, the face free from flush, and small drops of sweat appear on the forehead. When you get these effects, lower the head and shoulders more nearly to the horizontal, loosen the cord upon the arm little by little so that the flow of blood stops rather gradually instead of suddenly, dress the arm by a compress over the incision and a bandage to keep it in place. If the bleeding has been continued until the effects I have mentioned have been produced, without regard to the mere quantity of blood taken, you will find it immediately followed by general moisture

of the skin, sometimes faintness or a momentary approach to syncope, and great relief to the pain in the head. The amount of blood required to be taken to produce a given effect, differs much in different patients. I have seen some patients with meningitis from whom I was compelled to abstract one litre (℥xxxii) of blood to obtain the same effect on the circulation and general condition of the patient, as I have obtained in other cases of the same disease by taking only half that quantity (℥xvi). By one prompt, free bleeding, as I have described, you directly lessen the force of the heart's action, diminish the general vascular fullness, and make the blood less stimulating by materially diminishing the relative proportion of its red corpuscles. To hold the advantage you have thus gained, you should, even while the blood is flowing, or as soon after as possible, commence the administration of cardiac or arterial sedatives, apply warmth to the extremities and an ice cap to the head, and in an hour after the first dose of the sedative, give a full cathartic of calomel and jalap. If it does not move the bowels freely in three or four hours, hasten the action by from eight to twelve grams (℥ii to ℥iii) of sulphate of magnesia, or an enema of warm salt water sufficient to fill the rectum.

In the mean time the windows should be a little shaded and the sick room kept as quiet as possible and the doses of the sedative repeated every two hours until the frequency of the pulse is reduced nearly to the natural standard, and then so graduated as to time and quantity as to hold this control over the circulation without inducing vomiting. The sedative which I prefer for this purpose is the saturated tincture of veratrum viride in doses, for adults, of 0.25 to 0.33 c. c. (min. iv to v) every two, three, or four hours as may be found necessary to produce the desired control over the circulation. In some cases accompanied by great nervous disturbance and delirium, I have thought better effects were obtained by a combination of one part of the tincture of veratrum viride with two parts of the tincture of gelsemium, given in doses of 0.6 to 1.0 c. c. (min. x to xv) every three or four hours. Of course these doses must be reduced in treating children, to correspond with the age of the child. All the remedies I have now indicated should be made to follow the bleeding as quickly as possible and their effects carefully noted that in dose and time of administration they may be kept accurately adjusted to the condition of the patient. After the bowels had been freely moved by the cathartic, in severe cases, I have given alterative doses of calomel between the doses of veratrum for twenty-four hours and followed them by a saline laxative sufficient to produce a moderate evacuation of the bowels.

In a large proportion of the cases in which the measures I have indicated were commenced early and prosecuted judiciously, the disease was arrested, or the symptoms so much relieved as to obviate danger to life before the end of the third day, and an early convalescence followed. If, instead of this, however, symptoms of commencing effusion or exudation are developed as I described when speaking of the symptoms which mark the beginning of the second stage of the inflammatory process, the cardiac sedatives should be promptly discontinued or much reduced in quantity, and fair doses of iodide of potassium substituted in their place. The following formula is one of the most efficient that I have used at this critical stage of the disease:

℞			
	Potassii Iodidi	10.00 grams	℥iiss
	Tincturæ Digitalis	15.00 c. c.	℥iv
	Tincturæ Hyoscyami	15.00 " "	℥iv
	Aquæ Menthæ	90.00 " "	℥iii

Mix. Give four cubic centimeters (fl. ʒi) every two or three hours, in a little sweetened water. At the same time blisters may be applied to the mastoid spaces or back of the neck, or to both; and the cold applications to the head allowed gradually to increase in temperature until they become decidedly warm instead of cold. Sometimes these measures, if brought into requisition at the beginning of the transition from active excitement and hyperæmia to that of depression and exudation, will check the progress of the latter in time to prevent entire stupor and paralysis, and the patient will slowly recover. But they often fail and the fatal result soon follows.

In many of the milder cases, both of meningitis and cerebritis, the free application of leeches to the temples and mastoid regions may take the place of the first general bleeding. The same remark is applicable to the more active cases of tubercular meningitis; while the milder cases of this class are better intrusted to the cautious use of cardiac sedatives, iodides, hyoscyamus, and blisters, without the loss of blood by either leeches or venesection.

If the disease assumes a chronic form with effusion and enlargement of the head, as it often does when the attack occurs in infancy, I have seen more benefit from the protracted use of moderate doses of iodide of potassium, internally, and the repeated application of small blisters over the mastoid spaces, than from any other remedies. In such cases the diet should be simple and easily digested, yet sufficiently nutritious to sustain the patient.

During the first stage of active excitement in ordinary cases of acute cerebral inflammation, the patients need no other nourishment than toast-water or thin gruel, and in the latter stages milk in small doses. During convalescence the nourishment should still be mild and unstimulating, the exercise very moderate, with a careful avoidance of all mental excitement or active mental application.

In cerebral sclerosis or chronic inflammation of the connective tissue in certain portions of the brain, no remedies have been found to possess any certain control over the progress of the disease. In the cases that have come under my own observation, I have obtained more benefit from the protracted use of a combination of iodide of sodium, bichloride of mercury, and conium, than from all other remedies. The following is a convenient formula for its administration:

℞			
	Sodii Iodidi	12.000 grams	ʒiii
	Hydrargyri Chloridi Corosivi	0.066 "	gr. i
	Extracti Conii Fluidi	15.000 c. c.	ʒiv
	Elixir Simplicis	105.000 " "	ʒiiiss

Mix. Give four cubic centimeters (fl. ʒi) at breakfast, noon, tea-time and at bed-time, in a little water.

You may say that the iodide and the mercurial in this prescription unite and form an iodide of mercury, and ask me why I do not prescribe the latter directly. I answer that the sixty-six milligrams of corrosive chloride can combine with only a very small part of the twelve grams of iodide of sodium, and that the excess of the latter constitutes a very important part of the prescription. And numerous trials have shown that the administration of the iodides of mercury alone do not produce the same degree of benefit as when combined with the excess of iodide of sodium as in the prescription just named.

Patients who have not acquired a previous undue susceptibility to the influence of mercurials can generally continue the use of this combination several weeks without affecting the mouth or gums. Still the effects of mercurial preparations in this direction should be watched with reasonable care.

Some of the cases coming under the head of sclerosis are closely allied to, if not identical with, chronic rheumatic inflammation. In such, some benefit may be derived from the use of fair doses of salicylate of sodium or bromide of lithium, more especially if given in connection with the tincture or fluid extract of the phytolacca decandra. The phosphide of zinc (Dr. Flint), the chloride of barium (Dr. Hammond), and the nitrate of silver have been occasionally used with advantage and recommended by men of eminence. When, as is often the case, the patient suffers from much pain and restlessness during the night, a single dose of bromide of potassium or ammonium and hydrate of chloral, one to two grams each (gr. xv to gr. xxx) given about eight o'clock in the evening, will often procure rest for the night. Many recommend the bromides, and use them in full doses in the active stage of the more acute cerebral inflammations. While I have found these agents of very great value in allaying nervous hyperæsthesia and insomnia, I have not been fortunate enough to obtain much effect from their administration in any stage of active inflammation. And in a few cases, in which the attending physician had continued their use after the mental dullness or partial stupor had appeared from the accumulation of inflammatory products, the effect appeared to be injurious by adding to the depression. I have seen a few cases, both in children and adults, in which depletion and cardiac sedatives had relieved the accumulation of blood and effectually checked the tendency to effusion, yet the patients continued restless, wakeful, and the special senses morbidly acute, with a soft but quick or irritable pulse. In these giving fair doses of some reliable preparation of ergot alternately with the iodide of potassium, and a dose of the compound powder of opium and ipecacuanha, (Dover's powder), in the evening, has had a very happy effect. In such cases, the morbid excitability and impaired tonicity of the structure remains after the actual hyperæmia has been relieved. Consequently, the ergot, aided by the opiate at night, exactly meets the indication, and much relieves the patient; when further cardiac sedatives or depletion would only have increased his suffering, and endangered ultimate exhaustion and fatal collapse.

Convalescence.—The stage of convalescence following all grades of inflammation of the hemispheres of the brain and their investing membranes, is one of much practical importance, on account of the readiness with which the local hyperæmia and excitement may be rekindled by either mental or physical activity. It makes it necessary that the patient should not resume active exercise either of body or mind until the general tone of health is well restored; and even then, the resumption of exercise should be very gradual, with frequent intervals of rest. The diet, for several weeks, should be chiefly of milk, farinaceous articles, the lighter vegetables and fruits, with but little meat. In those cases of scrofulous and tuberculous meningitis in which one attack is recovered from, as often happens, it is not only necessary to take all the precautions I have just indicated during the ordinary period of convalescence, but all those means for counteracting the faulty constitutional condition and tendencies, which were urged upon your attention in the lecture on the treatment of scrofula should be diligently used for months or even years with the hope of preventing a renewal of the local inflammation. Special care should be

taken to prevent parents and teachers from allowing children of this class to apply the mind too intently or persistently in the process of education.

Neither should their physical exercises be too exciting or protracted. The aim should be to give such patients that habitual moderate out-door exercise that promotes nutrition and muscular strength, without positive fatigue or exhaustion; and that degree and kind of mental occupation which favors cheerfulness and mild discipline without high excitement, anxiety, or intensity of application.

And do not forget that, in all directions for physical exercise to this class of subjects, the muscles of the arms and chest need quite as much discipline as those of the lower part of the trunk and legs.

LECTURE XXXVI.

Cerebro-Spinal Meningitis—Sporadic and Epidemic Spinal Meningitis; Myelitis, and Spinal Sclerosis; Their History, Causes, Symptoms, Morbid Anatomy, Diagnosis, Prognosis, and Treatment.

GENTLEMEN: Ordinary sporadic attacks of inflammation located in the membrane and under surface of the brain, including the medulla oblongata and its junction with the spinal cord, and constituting cerebro-spinal meningitis, are not of very frequent occurrence at any period of life, but are met with more frequently among children than adults. They may arise from the same causes, and under the same circumstances, as inflammation of the pia mater and surface of the convex part of the hemispheres. The symptoms, progress and results differ from those accompanying inflammation of other parts of the cerebral surface, only on account of the difference in the functions performed. The intimate connection of the medulla and gray masses near the base of the brain with the nerves of special sense and those controlling respiration and circulation, is such that any inflammatory action set up in those parts, more speedily disturbs the hearing, vision, and respiratory movements, and in consequence of the latter, more frequently leads to an early fatal termination.

Symptoms.—Acute attacks are generally ushered in by a brief period of paleness, coolness of the surface and extremities, vertigo, one or two sudden turns of vomiting, immediately followed by intense pain in the occipito-frontal region through the base of the brain, buzzing or noises in the ears, flashes of light or dimness of vision, increased heat, flush of the face, contraction of the pupils, frequency and fullness of the pulse, retraction of the head from rigidity of the muscles of the posterior part of the neck, hurried breathing, and more or less delirium. In from six to twelve hours the hearing and vision are both suspended; one or both pupils begin to dilate, and the eyeballs to be turned from their natural direction and parallelism; the mental faculties more dull; the head more retracted, either directly backward or obliquely toward one side; frequent automatic movements of the extremities; respiration irregular with frequent sighing; pulse variable in frequency and sometimes intermitting, but retaining its volume and a fair degree of force, while the renal and all other secretions are much diminished. If the attack is severe and not

moderated by treatment, in from twelve to twenty-four hours more, the automatic movemen s of the extremities will have ceased from the supervention of paralysis; the face will appear less flushed; the pupils more completely dilated; the intestinal discharges involuntary, and the renal secretion suppressed; the pulse smaller, weaker, and more irregular; respiration sometimes hurried and panting, at other times slow, weak, and intermittent; deglutition either difficult or altogether lost, and the mind either wandering or comatose. A little later, the increasing paralysis of the muscles of deglutition and respiration permits the mucus to accumulate in the air passages, causing coarse mucous râles, soon followed by death. You observe in this description of the symptoms, the same stages or order of phenomena as in the acute meningitis, already fully considered. First, a brief period of intense injection of the vessels with high excitement; second, a period of transition, during which exudation or effusion is taking place, causing the contracted pupils, excited delirium, frequent and full pulse to give place to dilatation, dullness, variable pulse, etc.; and third, the period of general failure of functional action, or paralysis. These several stages are accompanied by the same pathological changes, and followed by the same kind of post mortem appearances in the membrane and surface of the base of the brain and medulla oblongata, as I pointed out to you when speaking of the results of inflammation of the membranes and surface of the upper part of the cerebral hemispheres.

Diagnosis.—The special symptoms which serve to distinguish inflammation of the base of the brain and medulla oblongata from all other affections, either of a functional or inflammatory character, are the rapid development of disturbances of respiration, hearing, seeing, muscular contractions and rigidity, especially in the posterior cervical region, in direct connection with intense pain in the head, and general fever. Mere reflex or functional disturbances are not accompanied by the rapid rise of temperature and increased tension of the carotid and vertebral arteries which mark the first stage of the inflammation; and when the latter attacks other parts of the brain and its membranes, the contraction of the cervical muscles, retracting the head, and the loss of vision and hearing, supervene at a later stage in the progress of the case, are generally less prominent, and sometimes absent, or nearly so.

Prognosis.—Almost any grade of inflammation involving the nervous centers of respiration and circulation in the medulla oblongata and ganglia at the base of the brain, is of serious import. So essential are these functions to the maintenance of life that they can not be interrupted, even for a few minutes, without fatal results. Consequently all acute attacks of inflammation in the nervous centers, controlling these functions, are highly dangerous, and a very large proportion of those attacked die in from three to seven days. And in many of the cases that do not prove fatal, the recovery is not complete, there remaining more or less permanent impairment of hearing or vision, or of both; and a smaller number in which there remains decided weakness of the cervical and dorsal muscles and much unsteadiness or impairment of locomotion.

Treatment.—In cases of ordinary sporadic inflammation of the membranes and base of the brain, the objects to be accomplished by therapeutic management, and the means for accomplishing them, are the same as in the treatment of the same grades of meningitis and cerebritis, which were fully discussed during the lecture hour of yesterday.* If there is any difference, it consists in the more urgent necessity for the early and efficient

*See pages 334–5 of this volume.

use of all those means which are capable of lessening the accumulation of blood in the vessels and capillaries of the inflamed parts during the first stage; in the hope of so modifying the inflammatory process as to prevent, or very much diminish, the amount of the exudation which would follow in the second stage, and which is so liable to prove sufficient to overwhelm functions essential to life. If you remember the shortness of the several stages of the disease, and the consequent necessity for the most prompt and vigilant attention to each case, you will be enabled to so adjust the means best adapted to meet the pathological exigencies of each stage under the rules I gave you in the lecture of yesterday, as will give your patients the best chance of recovery. There is, however, another form or grade of inflammation which attacks the base of the brain and its appendages, to which I must now direct your attention.

Epidemic Cerebro-Spinal Meningitis.—The disease to which I allude is seldom met with in isolated or sporadic cases, but usually presents the character of an epidemic, sometimes extending rapidly over large districts of country, but more frequently limited to neighborhoods or single townships or counties, to military camps, or even single buildings. Although not recognized and described as a distinct disease until the beginning of the present century, yet under names indicating some form of typhus, pretty accurate descriptions of the disease can be recognized in the histories of epidemics occurring in France, Spain and Italy, as early as 1310, and at various times during the fifteenth, sixteenth, seventeenth and eighteenth centuries, in most of the other European countries. It has been called typhus syncopalis, cerebral typhus, petechial typhus, cold plague, malignant purpuric fever, febris nigra, spotted fever, apoplectic typhus, cerebro-spinal typhus, cerebro-spinal meningitis, epidemic cerebro-spinal meningitis, and in the present nomenclature of the Royal College of Physicians, cerebro-spinal fever. Perhaps the first plain description of the disease in this country was by Dr. John Bard, who, in 1749,* described the prevalence of a disease in Rhode Island and some other parts of New England which was undoubtedly the disease under consideration; and Dr. Hugh Williamson gives an interesting account of the prevalence of a similar disease in North Carolina in 1792.† Most writers represent it as making its first appearance in the United States in the valley of the Connecticut river, as it passes through portions of Massachusetts, Connecticut and Vermont, in 1806 and 1807. From this time it continued to manifest itself in limited districts of New York, Pennsylvania, New Jersey, and as far south as Norfolk, in Virginia, until 1812. There was a limited prevalence of it in New York, in 1816; in Middletown, Connecticut, in 1823; and in Trumbull, Ohio, in 1828. From the last date I have found no account of the prevalence of the disease until 1840–1, when it reappeared in Vermont and Massachusetts, and apparently extended westward through New York in 1842–3, prevailing severely in some places, especially in the western part of the State. It made its appearance in different parts of Michigan and Illinois in 1843–4, and during these and the four following years, it visited different localities in all the States occupying the valley of the Mississippi and its tributaries from the Great Lakes to the Gulf of Mexico. Its general habit was to prevail in limited districts for one season, disappear, and appear in another series of places the next season. It rarely prevailed in the same place two years in succession; and equally rare that it spread by continuity of territory. On

* See Med. and Phil. Reg. Vol. 1.
† See Med. Repository, 1st series, Vol. II.

the contrary, it appeared in numerous places almost simultaneously, having no special connection of one with another. From 1850 to 1862, I find no mention of the prevalence of cerebro-spinal meningitis in any part of our country, except one or two limited outbreaks in 1852 and 1858. In the winter and spring of 1862–3, it reappeared almost simultaneously in a great number of localities, scattered through the Western and Southern States, and in several places in the Middle and Eastern States. From the last mentioned date to 1866, the disease invaded many new places each year. It then became less prevalent until 1872, when another marked increase in its prevalence was observed in different parts of the country. It prevailed in this city (Chicago) sufficiently severe to merit the name of an epidemic in 1863–4 and in 1872–3, and sporadic cases have occurred in other years.

Causes.—The predisposing causes or circumstances which appear to favor the development of epidemic cerebro-spinal meningitis, are: exposure to cold and damp air, overcrowded and badly ventilated dwellings, poor-houses, prisons, military camps, etc.; to which may be added excessive fatigue coupled with mental excitement or depression, age and sex. In regard to the influence of atmospheric conditions I may state in general terms that the disease has hitherto prevailed chiefly in the northern and middle part of the temperate zone, and far more frequently during the last half of winter and the early part of spring than at any other season of the year. Dr. Joseph A. Gallup, who wrote in 1815, while the facts relating to the epidemics in this country from 1806 to 1812 were fresh and familiar to him, personally, says: "With few exceptions it has broken out in the coldest seasons, and spread most alarmingly at such times in the different places it has visited. The months of January and February have oftenest given rise to it in point of season. When it rages considerably, it continues perhaps to the middle of the month of May, and then passes off gradually like other epidemics." * Dr. J. Adams Allen, who saw much of the disease as it prevailed epidemically between 1842 and 1850, says: "According to the writer's (Dr. Allen's) observation, it is more likely to occur in winters with a variable temperature—where a few days of intense cold are rapidly followed by days of thaw, mud and rain. Neither uniformly cold nor warm weather are so likely to engender it. But other influences unquestionably co-operate. It does not seem always confined to a particular season."† In examining the particular season of prevalence of a large number of the more severe outbreaks of the disease in the epidemic period extending from 1862 to 1872, I find them to have commenced in almost all instances during the months of January, February and March, and to have ended before the middle of June. The disease has at no time prevailed as severely in this city (Chicago) as in many of the country districts in this and the adjoining States. A few cases occurred in the month of June, 1863, while during the three preceding months cases of erysipelas were more numerous than usual. The only epidemic of much note commenced in February, 1872, and continued through March and April, during which more than one hundred deaths were reported to the health office as resulting from this disease. During the same months it prevailed with considerable severity in many of the most populous towns in the northern part of Iowa, Illinois, Indiana, the southern part of Wisconsin and Michigan, and in the western part of New York. From all the foregoing facts it is evident that there is something

*See "Sketches of Epidemic Diseases in the State of Vermont, from its first settlement to the year 1815," etc., etc. By Joseph A. Gallup, M. D., p. 225. 1815.

† See paper read to the Illinois State Medical Society in May, 1864. Vol. Trans. p 141.

more than mere accidental coincidence between the prevalence of the disease and the months of winter and spring. In other words, the usual atmospheric conditions present during the months of January, February, March and April, exert a positive, predisposing influence of much importance in the development of the disease. So far as allusions are made to the special meteorological conditions existing at the outbreak of the disease in the numerous reports to medical societies and articles in medical periodicals, they generally mention the predominance of cold and dampness with sudden and severe thermometric changes. That the impure air, caused by the overcrowding of dwellings, prisons, and military camps, favors the occurrence of cerebro-spinal epidemics, is abundantly proved by the many special outbreaks of the disease in such places which are on record; more especially in connection with military operations both in this country and in Europe.*

There are many facts on record that clearly indicate the important influence of excessive fatigue in connection with mental anxiety and fear in the fostering of attacks.

Age.—Although no period of life is exempt from attacks of the disease under consideration, yet in all places where it has prevailed among the population generally, much the larger number of cases have occurred in childhood and youth, and next, in the early part of adult life. Hirsch states that of 391 fatal cases 359 were under fifteen years of age. Of forty cases that came under my care in the winter and spring of 1872, six were between twenty and thirty years of age, ten between five and fifteen years, and twenty-four between six months and five years. I think this is a fair representation of the ratio of prevalence of the disease at the different periods of life, in the epidemics that have occurred in cities and country districts throughout this country; but when it makes its appearance at military posts, in barracks and prisons, the statistics will show a large ratio of prevalence in adult life. This was the case in France during the ten years following 1835, when the disease prevailed severely among the soldiers in the barracks and camps in different parts of that country. Hence Lefevre and other French writers state that the greatest mortality occurred between the ages of thirty and forty years.

Sex.—Writers generally agree in the statement that the disease is more prevalent among males than females. In military camps, barracks and prisons this would necessarily be the case, as the number of females present in such places is relatively very small. In civil life the difference is not great.

Specific or Exciting Cause.—In addition to the predisposing influences I have mentioned, it is claimed by most of the recent writers and observers that the disease arises from a specific exciting cause, the nature and origin of which, however, is entirely unknown. It is generally conceded that the essential cause is not a contagium, communicable from one individual to another, but is supposed to be some form of infection, analogous to that which causes typhus and other forms of continued fever. The reasoning upon the

* As a sample of facts touching this subject I copy the following paragraph from an interesting letter in the Chicago Medical Examiner, Vol. V, p. 402, 1864, by Dr. E. Y. Yager, giving an account of two epidemics in Chillicothe, Missouri. He says: "The epidemic of both 1862 and '64 was preceded by very cold weather. You will observe that no cases occurred until after the commencement of the thaw. The wind was generally from the east and very chilly. There was a dense fog preceding both epidemics. At the time of its prevalence in 1862 there were quartered near twelve hundred soldiers in different parts of the town. They were very much crowded; whole companies in houses that were not capable of accommodating more than fifteen. Measles prevailed to an alarming extent among soldiers and citizens. There was a very large mortality attending the epidemic of measles, and later in the season pneumonia typhoides was very prevalent. * * * The quarters and hospitals were in the worst possible condition. Following the epidemic of 1864, we have erysipelas and pneumonia typhoides."

subject is not conclusive. It is assumed that the epidemic character of the disease proves it to be dependent upon a *specific cause.* Assuming that it depends upon a specific cause is made the reason for classing it with the idiopathic general diseases, instead of placing it with the local inflammations. It has been suggested by some that while the disease may be a general fever caused by some organic poison, such poison, instead of being zymotic or imbibed from without, is developed from morbid molecular processes in the system.* My own clinical observations, aided by a careful study of the more noted epidemics on record, show two facts of much etiological interest. First, that there are marked differences in the clinical history of the disease under consideration, as it has prevailed in different times and places. Second, that all the more noted epidemics have been either coincident with or closely allied, both in time and place, to the prevalence of erysipelas or typhoid and typhus fevers, while a much smaller number have been coincident with the prevalence of malarious fevers. For instance, during its unusual prevalence in France and Spain from 1836 to 1845, the circumstances under which it originated, and many of the symptoms accompanying the disease, were such as to cause the profession in those countries to regard it as a form of typhus.

So the epidemic that commenced at Medfield, in Massachusetts, in 1806, and continued to recur in different places in this country until 1820, was so closely connected with the prevalence of typhoid and typhus fevers that it was almost universally designated as typhus petechialis, maculated typhus, cerebral typhus, etc. And it often happened that while the cerebro-spinal fever was prevailing in one neighborhood, in another the local manifestations were developed in the lungs, causing pneumonia typhoides, more frequently designated in those days, peripneumonia, and sometimes malignant pleurisy; and which often proved as rapidly fatal as when the cerebro-spinal axis was involved. Yet during all the periods alluded to, both in Europe and in this country, erysipelas was also unusually prevalent, as you may learn by studying the history of that disease. The second very extensive epidemic, which prevailed in different places, from the New England States west to the Mississippi river, and southward to the Gulf, between 1841 and 1850, was so completely identified with the coincident great epidemic of erysipelas, that the history of one necessarily involved that of the other. In most of the places where they prevailed, the cerebro-spinal disease occurred in the winter and spring, and the erysipelas in the summer and autumn either preceding or following. And in some places they were as intimately intermingled as are cases of intermittent and remittent fevers.† The same close connection between the epidemic prevalence of cerebro-spinal meningitis and erysipelas was observed during the severe prevalence of these diseases from 1862 to 1868, in the States of Illinois, Wisconsin, Michigan, Indiana, and as far east as the western part of New York. During the autumn of 1863 and the winter and spring of 1864 both erysipelas and typhoid fever were unusually prevalent in this city (Chicago), the former sufficiently so to constitute a noted epidemic. During the latter part of the same winter and spring many cases of cerebro-spinal disease also occurred, while the two former diseases were still prevailing. Perhaps the best account we have of the prevalence of these epidemics in the interior of this State, is from Drs. Lodge and Samuels who practiced extensively in Williamson county,

* See Transactions of Ill. State Med. Society, Vol. for 1864, p. 141.

† See short paper on cerebro-spinal meningitis, as it appeared in Clark county, Illinois, in 1845–6, 1858; and 1863–4–5. By F. R. aine, M. D. in the Trans. Ill State Med. ociety for 1866. See also Drake on the Principal Diseases of the Interior Valley, etc., second Vol., p. 759.

where the cerebro-spinal meningitis made its appearance in a very severe form in the latter part of the winters of both 1862 and 1863, and continued through the spring months. The erysipelas commenced in the summer of 1863 and continued during the following autumn and winter.*

That severe cerebro-spinal symptoms may occur in connection with periodical or malarial fevers, is so well known that when they occur they are generally recognized as indicating one phase of the pernicious intermittents. I have called your attention, gentlemen, to the intimate relations between the prevalence of epidemic cerebro-spinal meningitis and the well known acute general febrile diseases, which have been named, for the purpose of enabling you to see more clearly the bearing of the question, whether the cerebro-spinal disease is a part of a distinct general fever dependent on a specific zymotic cause, or whether it is simply a local disease occurring as an important complication in severe epidemics of erysipelas, typhoid, typhus, and malarial fevers. In other words, shall we regard the epidemics of dysentery, pneumonia typhoides, malignant pleurisy, and cerebro-spinal meningitis, as so many distinct general febrile affections, each dependent on a specific cause, or as local complications sometimes based upon the special cause of typhoid and typhus, sometimes on that of erysipelas, and at others on that of periodical fevers known as malaria? For a few years past the tendency of medical investigators has been strongly in the direction of increasing the number of general acute diseases or fevers, and of assigning a specific cause for each. It is under this tendency that acute dysentery, pneumonia, and cerebro-spinal meningitis, have already been taken from the list of local inflammations and transferred to the class of idiopathic fevers by most of the recent writers on practical medicine. I must acknowledge, however, that the more I observe these affections at the bedside of the sick, and the more minutely I study the histories of the past epidemics, as recorded by those who actually witnessed them, the more nearly am I brought to the conclusion that they are simply local affections modified in their phenomena and results by whatever general miasmatic or infectious cause may be existing at the time, whether it be the idio-miasms that produce typhoid and typhus, the infection of erysipelas, or the malaria of the periodical fevers. This view affords a much more complete explanation of the noted differences in the symptoms and results accompanying these diseases at different times and in different localities, and also of the equally diverse results of the same methods of treatment in different places and epidemic periods. It is also much better calculated to lead the practitioner, when he meets these important outbreaks of disease, to observe carefully the coincident character and tendencies of the general febrile affections that have immediately preceded or are accompanying them, and to base his treatment on the actual pathological conditions present, instead of being influenced largely by the theoretical idea of the presence and action of some one specific organic poison, on which he is led to believe the disease before him always depends.

Symptoms.—The general group or assemblage of symptoms that accompany attacks of epidemic cerebro-spinal meningitis, so closely resemble those I mentioned as characterizing attacks in sporadic cases, in the first part of the present lecture, as to render their full repetition unnecessary. In some of the epidemics, the initial symptoms have developed less rapidly;

* Dr J. C. Jewell, speaking of the two diseases as seen by Drs. Lodge and Samuels, says: "The two epidemics (spotted fever and erysipelas) were commingled in the practice of these gentlemen, occurring at the same time and in the same place, inducing in them the opinion that the two forms of disease were connected by some link common to both." See Trans. Ill. State Med. Society for 1864, p. 25.

the pulse has been softer, more variable and more frequent; and while the patients retained their consciousness, they complained of great lassitude and weariness, with severe pains in different parts of the body and limbs, in addition to that in the head. In other epidemics, one of the noted features was the shortness of the initial stage and the sudden onset of the more dangerous symptoms, often so rapidly overwhelming the cerebro-spinal functions as to cause a fatal result in a few hours. In still other epidemics, a large majority of the cases were ushered in by a distinct chill, and the fever following exhibited well-marked exacerbations and remissions. Such was the character of the epidemics that occurred in the middle and lower parts of the Mississippi Valley, from 1842 to 1850, as described by Drs. S. Ames, of Montgomery, Alabama; E. D. Fenner, of New Orleans; D. Drake, of Cincinnati, and others.* The well-marked though moderately severe epidemic of 1872, as it occurred in this city, was faithfully described in a clinical lecture at the time, as follows:

"The cases have varied much, both in the severity and variety of symptoms, and yet have preserved enough of uniformity to identify them as belonging to one group, and dependent on some common pathological conditions. For instance, in all the cases the access of the disease was sudden or abrupt. They all give evidence, at first, of unusually severe pain in the head, with very variable neuralgic pains in distant parts, especially in the abdomen, thighs and legs; and, in from one to three days, rigidity of the muscles of the neck, with some retraction of the head, and general hyperæsthesia sufficient to cause even the youngest child to manifest signs of distress on being touched or moved. In nearly all the cases there has been, during the first twelve hours, active vomiting, increased by raising the head to the erect position; and in some, coincident purging. These gastric and intestinal symptoms have seldom continued beyond the first one or two days. The temperature is generally increased, especially in the back of the head; the pulse is frequent and firm; the respirations increased in frequency, and in most cases, *panting*, like one excessively fatigued from severe exercise; face flushed, and expression excited and anxious at first, but subsequently dull, with dilation of the pupils; urine generally scanty and high-colored, but, in some cases, abundant throughout the whole course of the disease; tongue covered with a white fur; mouth moist; and after the first one or two days, the bowels inclined to constipation, with the abdomen flaccid, and entirely free from tympanitis. About one third of the cases presented some red erythematic spots on the skin, between the third and seventh days of the disease. These spots varied much in size and number, as well as in shade of color. In the milder cases they were bright red, and often so few in number as to attract no attention, unless looked for particularly; and in others they were so numerous as to create the impression that the case might be one of scarlatina. In the more severe cases, the spots were darker in color, larger in size; and in two cases they were accompanied with tumefaction, from subcutaneous infiltration, as in erysipelas. In a young woman who died on the fifth day after the attack, but whom I did not see until the day previous to her death, there were numerous large, purple, hæmorrhagic spots on the lower extremities, and an oblong, elevated, purplish red spot, from one to two inches long, and from half to three quarters of an inch in width, on the front part of each ankle and the outer face of each wrist. The head was held rigidly and obliquely to one side; the eyes were divergent; the pupils dilated, and mind entire-

* See Drake on the Principal Diseases of the Interior Valley of North America, second vol p 758.

ly unconscious. In a majority of the cases, however, I failed to discover any special eruptions or spots on the surface. Nearly all the cases manifested during their progress, paroxysms of excited delirium; and in the children some of the first turns of vomiting were followed by protracted turns of wild screeching and crying, and sometimes trembling, as if under the influence of a terrible fright. Only four cases out of the forty that came under my care were accompanied by general convulsions, three of which died and one recovered."*

Morbid Anatomy.—During the epidemic just described, I had an opportunity to make but one post mortem examination. This case was an adult male, who died in the Mercy Hospital on the third day after admission, and on the seventh day from the commencement of the attack. The characteristic symptoms of the disease had all been strongly marked during the progress of the case. The autopsy revealed from ninety to one hundred and twenty cubic centimeters (fl. ℥iii to ℥iv) of reddish serum between the arachnoid and pia mater, and in the lateral ventricles, with the most intense injection or turgescence of the vessels of the pia mater covering the base of the brain, medulla oblongata, and upper part of the spinal cord. The vessels of the brain substance were also fuller than natural; but there had been no exudation of lymph or plastic material; and there were no other morbid appearances apparent to the unaided eye. My colleague, Dr. J. S. Jewell, in his paper on the cerebro-spinal meningitis, read to the Illinois State Medical Society in 1866, collected and examined accounts of about two hundred autopsies. From these examinations, and from many others since, it appears that the most constant of all the post mortem phenomena are congestion with more or less inflammation in the pia mater and surface of the base of the brain, medulla oblongata, and upper part of the spinal cord. In a large majority of the cases there is also some serous, sero-purulent, or purulent exudation or effusion upon the surface of the pia mater, between it and the brain structure, and in the lateral ventricles. The amount of serum varies from one or two cubic centimeters to as many hundred, (fl. ℥ii to ℥vi); its color is usually a little turbid, sometimes reddish from intermixture of blood corpuscles, and at other times more purulent, and of a creamy consistence. In only a small number of cases has there been any true plastic exudation, either in the serum or upon the surface of the membranes. The vessels of the brain structure were often seen congested, and sometimes, though rarely, the structure itself softened.

Microscopic examination shows migrating white corpuscles in the congested parts of the brain, medulla, and spinal cord; and abundance of pus corpuscles in the effused serum, with some fibrin, and occasionally red corpuscles. In a few cases, the effused fluid has appeared gelatinous from the amount of mucin it contained. As a rule, the more speedily fatal an attack proved, the less were the anatomical changes recognizable after death. The same rule, however, is applicable to all severe epidemic diseases. No changes specially characteristic of this disease have been found in other parts of the body. In the epidemics which prevailed in this country from 1806 to 1820, and in France from 1835 to 1845, many of the post mortems revealed important changes in the thoracic organs; such as severe engorgement of the lungs with dark blood in some; pleurisy, and pleuro-pneumonia in others; serous and sometimes purulent deposits in the cavities of the pleura and pericardium in a few; while in others there was only hypostatic congestion or no change of any kind. Many of the

* See Clinical Lectures on Important Diseases. By N. S. Davis, M. D. etc, pp. 245-6-7, 2d Ed. 1874.

same examinations showed hyperæmia and slight tumefaction of the glands of Peyer and Brunner in the ilium, and in a very few cases, some degree of ulceration.

The autopsies made during the epidemics prevailing in this country from 1841 to 1850, and from 1862 to 1870, revealed much less pathological changes in the viscera of the chest, and decidedly more in the kidneys, small intestines, and mesenteric glands. The most noted change in the blood itself was an increase in the relative proportion, both of fibrin and red corpuscles, with an unusual tendency to form coagula in the cavities of the heart and larger vessels.

Special Pathology.—Whether you are to regard the disease under consideration as a general cerebro-spinal fever arising from a special zymotic cause, or a local inflammation engrafted, in some periods, upon a general typhous epidemic; in others, upon an erysipelatous epidemic; and in still others, upon some modification of the malarial poison, in either event, both the symptoms during life and the pathological changes revealed by post mortem examinations show that the principal seat of disease and source of danger to the patient, is in that part of the nervous centers composing the base of the brain, medulla oblongata, and upper part of the spinal cord with the immediately investing membrane. They also show that the disease affecting the parts named, is really an asthenic grade of inflammation, in which the elementary properties of the parts are so altered as to impair the tonicity or contractility of the smaller vessels and the natural molecular movements, thereby inducing rapid accumulation of blood, aplastic exudations, and the early suspension of functions essential to the continuance of life. In cases of the highest grade of severity, the properties of the tissues involved are so profoundly altered, as to arrest the natural molecular movements entirely and cause death in a few hours, leaving but little traces of congestion or other inflammatory appearances visible to the unassisted eye.

Diagnosis.—The diseases with which epidemic cerebro-spinal meningitis is most liable to be confounded are typhus fever, malignant scarlet fever, pernicious intermittents, and ordinary sporadic inflammation of the brain. From the first, it is to be distinguished by the suddenness of the attack, usually accompanied by vomiting, and the early occurrence of rigidity of the cervical muscles and retraction of the head. Attacks of the second and third may be equally sudden, and are also accompanied by vomiting in a large proportion of cases; but they present neither the stiffness of the neck nor the retraction of the head, which so uniformly characterizes the cerebro-spinal disease; unless the latter actually exists as a complication, which sometimes happens. You will also derive some aid from the presence or absence of a general prevalence of either scarlatina or periodical fevers. To differentiate between the epidemic and the ordinary sporadic cases of cerebro-spinal inflammation, is more difficult. If you keep in mind the facts that the former usually occur suddenly without any known exciting cause; that several cases occur nearly simultaneously in the same community, or follow each other in quick succession, that the pulse is softer and more variable in frequency, with less rapid rise of temperature, and earlier retraction of the head; while the latter are generally preceded by known exciting causes; occur singly; develop early a higher temperature and fuller pulse, and more uniformly contracted pupils, and are not marked by any purple or petechial spots on the cutaneous surface in the middle and latter stages of their progress, you will be able to keep the line of distinction with reasonable certainty.

Prognosis.—The disease under consideration is always attended by a

high ratio of mortality. Most of the foreign writers make the ratio vary from 50 to 75 per cent. In this country there have been very great differences in the death rate, in different epidemic periods and in different places during the same period. From Dr. Gallup's detailed account of the epidemics in Vermont from 1807 to 1815, I find the number of deaths in proportion to the whole number of cases given, in only a few instances. During its prevalence in the town of Reading in the winter of 1811, of 55 cases only 8 died. In the same town in the winter of 1812, of 60 cases 9 died; while in the neighboring town of Plymouth during the same season, of 30 cases 4 died. These aggregate 145 cases and 21 deaths, or 1 in 6.90. During the years 1812 and 1813 the disease prevailed severely in the environs of Philadelphia and in neighboring towns, an account of which may be found in the Medical and Philosophical Register, vol. iii. During that epidemic, the mortality is stated by Dr. Philip S. Wales, U. S. N., as one in four or five cases. The epidemic that occurred during the great epidemic period of erysipelas, from 1841 to 1850, produced a larger ratio of mortality than those occurring during the first two decades of the present century, and has been equaled since only by the prevalence of the disease in the States occupying the middle and lower parts of the Mississippi Valley, from 1862 to 1868, commencing while extensive military operations were going on in these States.

Dr. S. Ames, of Montgomery, Alabama, whose Monograph, published in 1848, contained, perhaps, the best account of the disease as it prevailed in the Southwestern States during the period between 1841 and 1850, is very generally quoted by more recent writers as making the ratio of mortality 60 per cent. This is manifestly incorrect. Dr. Ames grades the whole number of cases into three classes, the mild, the grave, and the malignant, and expressly states that of the last named class 60 per cent died. He further states that but few of those cases classed as grave cases died, and none of those ranked as mild. He further represents the malignant class as embracing a little more than one half of the whole number of cases that occurred. It is evident, therefore, that in the epidemic described by Dr. Ames the ratio of deaths to the whole number of cases was not far from 33 per cent. And this is probably very nearly the correct ratio of deaths from the disease throughout the whole of that epidemic period. For while in some isolated or very limited outbreaks of the disease nearly all the cases died, in the great majority of places where the whole number of cases from the beginning to the end of the epidemic can be ascertained with an approximation to accuracy, the death rate ranged between 1 in 1.5 and 1 in 7, or a general average of 1 in 3.*

Of the forty cases that came under my own care during the months of February, March and April, 1872, thirty-two recovered and eight died. Of the eight fatal cases, one died in about twenty hours from the commencement of the attack, two in four days, one in five, one in six, one in seven, one in twelve, and one in twenty-eight days.

It has been very generally observed, that the attacks which occur at the beginning of an epidemic, in any given locality, are more malignant and cause a much larger ratio of deaths than those which occur after the epidemic has passed its crisis and the number of new cases is diminishing. The same rule, however, applies to all severe epidemic diseases.

Having spent more time than I had intended in the consideration of the history, causes, and relations of the disease, I must defer the discussion of its treatment until the next lecture hour.

* See Report on Practical Medicine and Epidemic Diseases, by D. Francis Condie, M. D., in the Trans. Amer. Med. Association, Vol. ii. pp. 156-7, 1849.

LECTURE XXXVII.

Epidemic Cerebro-Spinal Meningitis Continued.—Its Treatment and Sequelæ.—Spinal Meningitis and Myelitis; Their Causes, Symptoms, Morbid Anatomy, Diagnosis and Treatment.

GENTLEMEN: In regard to the treatment of epidemic cerebro-spinal meningitis, or spotted fever, very much might be said of historic interest, strikingly illustrating the tendency of the human mind to resort to heroic and even reckless medication, in combating diseases of sudden development and fatal tendency. Bleeding, general and local; vomiting and purging; calomel, opium, quinine, alcoholic anæsthetics, and blistering, have all been resorted to at different times and places, and used with an unsparing hand. Each has been commended by some and condemned as worse than useless by others. In the epidemics occurring during the first two decades of the present century, venesection was practiced very freely by a large proportion of the practitioners in the New England States. For instance, we are told by Dr. Gallup, that seventy-three cases of spotted fever occurring in the towns of Greensborough and Hardwick, in the spring of 1811, were treated by Dr. Huntington without a single fatal case. "He bled from *one* to *five* times, sweated, gave also val. tincture of gum guaiac, ether, etc."*

In another place, Dr. Littlefield, who treated many cases during an epidemic in the winter and spring of 1813, is represented as bleeding the patients from two to four times, from twelve to twenty-four ounces each time, with very great success.†

Dr. Gallup himself treated eighty-one well marked cases, embracing all ages and both sexes, during the epidemic of 1811, without any opium, but with from one to four bleedings, in more than half of the cases, and with the loss of only one of the whole number. Others used emetics, cathartics and calomel very freely during the same epidemic, but with very little evidence of good results. Of all the remedies used, however, none were used more lavishly than opium and the alcoholic liquors. Throughout the Connecticut Valley, where the doctrines of Drs. Miner and Tully in regard to the use of opium in fevers, exerted much influence, these remedies were given in cases of spotted fever in doses and quantities so large as to suggest doubts concerning the sanity of those who directed their administration. Dr. Miner says that, "Opium was the most important remedy in the severe form of this disease. * * * A few cases imperiously required half an ounce of the tincture in an hour, or half a drachm in substance, in the course of twelve hours, * * * and even some cases required a drachm in the same time. *All these patients recovered.*" Dr. B. H. Catlin, of Meriden, Connecticut, cites cases in which from three to five grams (gr. xlv to lxxv) of opium were given each day for two or three days in succession. Concerning a young lady of fifteen or sixteen years of age, to whom he was called on account of the sickness of her attending physician, he says: "She was taking a large pill of opium, between two and three grains, every four hours; a large dose of laudanum, nearly a teaspoonful, every four hours; infusion cort. cinchona, brandy, and pepper tea, all the stomach would bear." Dr. Catlin does not say, however, that "all these patients recovered." On the contrary, he admits that many of them died; and plainly suggests that many cases were

* See Gallup on Epidemics, p. 67.
† Ibid, p. 73.

altogether fictitious, the cerebral symptoms and sinking being produced by the remedies instead of the disease.*

Equal extravagances have characterized the treatment of many cases during the later epidemics, as in those of the first two decades of the present century. For example, Dr. J. Adams Allen, in the paper read by him to the Illinois State Medical Society, in 1864, says: "I have known fifty grains of morphine given, within a dozen hours, to a boy of fifteen, to relieve him from the terrible pain and suffering, with no avail, save that death followed." And he adds: "Incalculable quantities of brandy and quinine, of capsicum and carbonate of ammonium, have been poured into the stomachs of the comatose." †

I have made these brief allusions to what may be called the extravagances of the past, for the purpose of giving you some idea of the variety of treatment to which the disease has been subjected, and still more to show the extent to which the human system can be rendered insensible to the action of the most powerful drugs by the presence of certain conditions of disease.

You all know that the human system in its healthy or normal state of susceptibility and molecular movements would be dangerously if not fatally narcotized by less than one third of the five grams (gr. lxxv) of opium which were given two and three days in succession, and in some instances without fatal effects. Similar want of susceptibility to the action of opiates and alcoholics, is also seen in cases of tetanus, delirium tremens, and many of the more malignant cases of general fever. But such tolerance of any particular drug, neither proves that the drug is indicated, nor its administration in unusual quantity free from danger. On the contrary, it rather points to the necessity of using something more directly calculated to arouse the general susceptibility and vasomotor activity, and thereby avert the danger of entire suspension of molecular movements in the nervous centers as occurs in the more rapidly fatal cases on the one hand, and on the other, establish a better response to the impression of remedial agents of all kinds. The danger of administering enormous or unusual quantities of any narcotic or anæsthetic during a stage of extreme pain or temporary suspension of susceptibility from a morbid condition, consists in the fact that a sufficient quantity of the drug may remain in the system after the pain ceases or the susceptibility to its action returns, to produce dangerous toxic effects. When it was customary to treat tetanus and delirium tremens with very large and frequently repeated doses of opium, not a few of the patients died from excessive narcotism after the tetanic spasms and delirium had ceased. Even during the last few years no less than three cases of delirium tremens have come under my own observation in which the attending physician after giving large and frequent doses of bromides, chloral hydrate and morphine, finally induced sleep, but it was a sleep from which they never awoke. In one of the cases the last dose was a hypodermic injection of morphine.

The leading indication to be fulfilled, or object to be accomplished, by treatment in the special form of disease under consideration, is to obtain an early abatement of the morbid action and vascular fullness in the cerebro-spinal nervous centers, thereby relieving the pain, relaxing the muscular rigidity, and preventing fatal paralysis. From what I stated in the preceding lecture concerning the close association of the disease with erysipelas on the one hand and with typhus on the other, you will infer that

* See Report on the Climatology and Epidemic Diseases of Connecticut. By B. H. Catlin, M. D. in the Trans. Amer. Med. Association, Vol 16, pp. 486–488, 490.

† See Trans. Ill State Med Society for 1864.

the nature of the inflammatory process or morbid action in the cerebro-spinal textures will either partake of the specific qualities of the former or of the asthenic grade of the latter. Consequently direct depletion by bleeding could be beneficial only in the beginning of such exceptional cases as presented unusual cardiac force and arterial tension. And the same rule would apply to the use of such cardiac sedatives as the veratrum viride and aconite. In the great majority of cases we must rely upon those agents which are known to be capable of so acting upon the vaso-motor nerves as to induce contraction of the cerebro-spinal vessels, thereby lessening the fullness of blood and checking the tendency to exudation and effusion. Perhaps the most reliable agents we possess for that purpose are the ergot, physostigma and belladonna. In the epidemic of 1872, in this city, I treated the first three cases that came under my care with local bleeding by leeches, followed by blisters; the internal use of bromides, iodides, and mild laxatives, aided by ice bags to the head and neck, but with no marked benefit. The first case terminated fatally, and the next two were doing badly, when I substituted for the remedial agents just mentioned, the administration of the tincture of physostigma with decided benefit. From that time to the end of the epidemic I gave the physostigma and ergot combined, to nearly all of the cases that came under my care, as the leading remedies during the active stage of the disease. When called soon after the commencement of the attack, I usually directed a sack or pillow of pounded ice to the occiput; or if this could not be obtained, cloths wet in cold water and frequently renewed; and the following prescription to be given internally:

℞	Tincturæ Physostigmatis	45.0 c. c.	℥iss
	Extracti Ergotæ Fluidi	75.0 c. c.	℥iiss

Mix. Give to an adult four cubic centimeters (fl. ʒi) every two or three hours, according to the urgency of the symptoms.

If there was gastric irritability with more or less vomiting, I directed four cubic centimeters (fl. ʒi) of the following formula to be given half way between the doses of the physostigma and ergot:

℞	Acidi Carbolici	0.40 grams	gr. vi
	Glycerinæ	15.00 c. c.	ʒiv
	Tincturæ Gelsemini	15.00 c. c.	ʒiv
	Aquæ	90.00 c. c.	℥iii

Mix.

If there had been no movement of the bowels during the preceding twenty-four hours or more, I gave a single powder containing three decigrams (gr. v) each of calomel and bicarbonate of sodium, and if it did not move the bowels in four hours, aided it by a moderate dose of the Rochelle salts or citrate of magnesium. If after the first one or two days the disposition to vomit ceased, which was usually the case, the carbolic acid and gelseminum mixture was omitted. Whenever the rigidity of the muscles of the neck and the pain in the head had abated, the interval between the doses of physostigma and ergot were lengthened to three, four, six and finally to eight hours. If as convalescence approached, the patient was restless, mentally wandering, or sleepless during the night, I found a single, fair dose of the compound powder of opium and ipecacuanha

with pulverized gum camphor, given at bed-time each night to procure good rest and to materially hasten the establishment of convalescence. As soon as the latter was fairly established, the ergot and physostigma were omitted; for when continued longer, they appeared to increase the tendency to that cerebral anæmia and general emaciation which in some instances greatly protracted the period of convalescence. In a few cases after the crisis or active stage of the disease had passed, an exacerbation of fever would occur about the same time each day. These were quite uniformly interrupted by two or three moderate doses of sulphate of quinia each day. After the first day the patients were carefully sustained by simple nourishment, consisting principally of milk and beef tea, given in small doses, regularly, at short intervals. By the foregoing management, carefully adjusting the doses to the age of the patient and the activity of the disease, of the whole number that came under my care one out of six died.* You must remember, however, that every epidemic of this disease needs to be studied carefully, both in relation to the special character of the symptoms it presents, and its relation to the coincident prevalence of other diseases. And the treatment must be varied to suit the special character of each epidemic. If the disease should manifest itself at a time when coincident diseases were manifesting an active inflammatory tendency, as was evidently the case in Vermont from 1811 to 1813, I should not hesitate to take one free bleeding from the arm at the beginning, following it promptly by arterial sedatives and a mercurial cathartic, after which the ergot would be applicable, and most of the other measures I have indicated. If it should come in the midst of a general epidemic of erysipelas, as was the case from 1841 to 1850, I would place less reliance on cold applications to the head and neck and the use of ergot and physostigma, and more on early douches of warm water to the occiput, followed by blisters and the internal use of hyposulphites of sodium and belladonna, tincture of chloride of iron, tincture of cantharides, and due attention to the action of the kidneys and bowels. And if there should be present also a strong malarious influence, causing most of the attacks to be ushered in by a decided chill and imparting to the subsequent fever some degree of remittent character as was the case in many places in the middle and lower part of the Mississippi valley, both in the epidemics of 1841–50, and 1862–8, I should expect to obtain much benefit from the timely use of fair anti-periodic doses of sulphate of quinia. In regard to opium, which many writers place at the head of the list of remedial agents for the treatment of this disease, I can only say that its use during the active stage of the disease in such cases as have come under my observation, has proved positively injurious. But in the stage of decline, to allay restlessness and procure sleep at night, and to control neuralgic pains during convalescence, it has proved very beneficial, especially when given in connection with camphor or quinine. If given in the early stage of the disease at all, it should be in moderately full doses just after a general or local bleeding sufficient to temporarily relieve the vascular fullness. With the systolic force of the heart and the tension of the vessels abated by the loss of blood, or less certainly by the use of cardiac sedatives, the efficient influence of opium in overcoming the morbid excitability of the structures, would have a strong tendency to prevent the renewal of the vascular fullness, and help to cut short the inflammatory process. If whatever remedies are used in the first stage of the disease should fail to arrest, or so far modify the morbid conditions as to prevent exudation and effusion, and

* For further details see volume of Clinical Lectures on Various Important Diseases, edited by Frank H. Davis, M. D., 2d ed., pp. 241-50, 1874.

stupor, coma and paralysis ensue, there is little reason to hope for a favorable result from further treatment. And yet it may be well to apply blisters and mercurial inunction, and give internally full doses of iodide of potassium, either by the mouth or in nutritive enemas when deglutition is difficult or suspended, for the purpose of preventing further exudation and promoting the absorption of what may already exist; as recoveries have occasionally taken place from conditions apparently hopeless. In all cases in which convalescence follows attacks of this disease, great care should be taken to have the patient avoid all active mental or physical exercise or excitement until strength and nutrition are well restored. Much rest in a recumbent position, good air, a moderate variety of plain, easily digested food, and the avoidance of *strong* tea and coffee, and of all kinds of fermented or distilled drinks, will insure the most rapid and complete recovery with the least danger of relapses. If any medicine is used during convalescence, such as will aid in re-establishing healthy nutrition will be the most useful. For this purpose you may direct the patient to take four cubic centimeters (fl. ʒi) of the syrup of lacto-phosphate of lime, or of the compound syrup of the hypophosphites, just after each meal, and the same quantity of the fluid extract of the humulus lupulus at bed-time. The latter will allay nervous restlessness and promote natural sleep.

Sequelæ.—The important pathological conditions liable to follow as a result of the epidemic cerebro-spinal meningitis, are, a spanæmic or impoverished condition of the blood with general impairment of nutrition; frequent and severe neuralgic pains, often changing their location from one set of nerves to another, with difficulty of maintaining the erect position without inducing vertigo and muscular trembling, and more or less permanent impairment of vision, and, in some cases, of the mental faculties also. The first condition I have mentioned is best remedied by a continuance of the same management that I have just mentioned as proper during the stage of convalescence. The cases included in the second condition or sequel, differ from the first in the fact that they are still affected with a certain degree of irritation or morbid sensitiveness in the cerebro-spinal centers in addition to the general anæmia. And it is the continuance of this central irritation that causes the tormenting neuralgic pains without the least regularity as to time or place; although in a majority of cases they are most frequent and severe in the heads of the gastrocnemii muscles, in the abdomen, and in the head. In nearly all the cases of this kind that came under my observation, I gave a mixture of two parts of camphorated tincture of opium with one part of the tincture of physostigma each morning, noon, and tea time, and a moderately full dose of the compound powder of opium and ipecacuanha with quinine at bed-time, with early and permanent relief. Some of this class of cases were troubled less with neuralgia, and while at rest, appeared quite well, but every attempt to maintain the erect position or walk, would cause marked dilation of the pupils, vertigo, and trembling of the voluntary muscles to such an extent as to threaten convulsions unless the recumbent position was immediately resumed. One of the most prominent cases of this kind was that of an adult male, naturally strong and healthy, to whom I was called in consultation nine weeks after he had been attacked with the epidemic cerebro-spinal disease in 1872. He passed through the active stage of the disease and reached apparent convalescence at the end of the second week. The only symptoms that remained were a moderate enlargement of the pupils, a pallid or anæmic hue of the surface, slowness of the pulse when resting in the recumbent position, which became quick and variable when the patient attempted any muscular exertion, and wide dilation of

both pupils, with vertigo and universal muscular trembling to such an extent as to render him incapable of remaining one minute in the erect position. His temperature was natural, appetite fair, renal secretion good, and mental faculties unimpaired. His attending physician, regarding the symptoms I have mentioned as the result of serous effusion into the lateral ventricles, had kept him on a spare diet and from three to six gram doses (gr. v to x) of iodide of potassium up to the time of my visit, but with no improvement in the condition of the patient.

The natural expression of countenance, the ready use of the mental faculties, the ability to command the movements of any of the voluntary muscles when at rest in the recumbent position, appeared to me incompatible with the existence of effusion either into the ventricles or upon the surface of the brain; while the dilation of the pupils, the vertigo, and the muscular agitation produced by an erect position clearly indicated cerebral amæmia and defective nutrition. I consequently persuaded his physician to omit the further use of the iodides, and substitute in their place fair doses of the compound syrup of the hypophosphites; to allow a more liberal diet of plain food, and avoid, as far as possible, all muscular exertion or change from the recumbent position. Under this simple method of treatment he soon began to show signs of improvement, and in about three months, fully recovered, and subsequently resumed his occupation as an engineer.

Those cases of decided impairment of the hearing and vision, with partial paralysis and imperfect use of the mental faculties, which are occasionally met with as the sequel of severe attacks of epidemic cerebro-spinal disease, are but little influenced by any treatment that has been devised. In these cases, the structural changes in the inflamed portions of the brain have become permanent; and though the patient may live for months, or even years, very few ever gain the normal condition of their cerebro-spinal functions.

The next subject to which I must direct your attention is

SPINAL MENINGITIS.

By spinal meningitis, I mean inflammation of the membranes and surface of any part of the spinal cord from its junction with the medulla oblongata to its caudal extremity. Simple idiopathic inflammation of this part of the central portion of the nervous system, is not of frequent occurrence, if we exclude from our consideration those cases that arise from the causes of constitutional syphilis and rheumatism, both of which have been sufficiently discussed in lectures thirty and thirty-one of the present course. The outer membrane, or dura-mater, of the cord is liable to the same forms of disease as that which envelops the brain, and which I have described under the names of pachymeningitis externa and interna. But they arise from the same causes, and are so generally associated with the corresponding pathological conditions within the cranium that a separate description is not necessary. Inflammation of the arachnoid and pia mater may be met with in all grades of activity from the most acute to the most chronic form of the inflammatory process.

Etiology.—The most common causes of simple spinal meningitis are mechanical injuries, such as concussions, contusions, twisting, or wrenching, etc., and sudden exposures to wet and cold. The first class of causes are most liable to induce a subacute grade of inflammation, limited to some one section of the cord, while the sudden exposures to wet and cold more generally induce acute attacks, embracing the whole length of the cord.

Symptoms.—The commencement of acute inflammation of the pia mater and surface of the cord is usually characterized by chilliness or rigors, with paleness of the features, and severe pain in the back. The first two symptoms continue only from one to three quarters of an hour, and give place to some flush of the face, moderate elevation of temperature, greater frequency and fullness of the pulse, respiration shorter and more frequent, and very severe pain in the affected part of the spine, much increased by motion. There is also generally hyperæsthesia or increased sensibility of the cutaneous surface, with acute pains following the course of the spinal nerves both around the body and in the extremities, and often accompanied by muscular contractions causing a sense of constriction like the impression of a hoop or band around the body. The tongue becomes covered with a whitish coat, the urine scanty, high colored, and more acid than natural, the patient very restless yet tortured with great increase of pain by every attempt to move or bend the spine, and frequent cramps or rigid contraction of some of the muscles. When the inflammation is acute and extending the whole length of the spine, or even the length of the cervical and dorsal portions of it, the pain in the spine and along the course of the intercostal and other thoracic nerves with the accompanying muscular contractions or rigidity, so interferes with respiration as to cause intense suffering and anxiety, and sometimes causes sudden death by apnœa, in the early stage of the disease. If the patient escapes this danger, in from three to seven days, according to the grade of activity, the symptoms begin to change, the temperature diminishes, the pulse becomes smaller and often variable in frequency; the pains and hyperæsthesia diminish, with corresponding abatement of muscular cramps and rigidity; and in one or two days more, the hyperæsthesia and pain have given place to anæsthesia or loss of sensibility, and the previously contracted muscles become entirely relaxed. In other words, paralysis of both sensation and motion has followed the stage of irritation. These effects will be manifested only in such parts as are supplied with nerves from the inflamed portion of the spinal cord and the parts below. If the upper part of the cord is involved, the paralysis may include the muscles of the chest to such an extent as to cause a fatal result from the suspension of respiratory movements. If the disease is limited to the lower half of the cord, the paralysis may affect only the lower extremities, or it may extend high enough to include the hips and viscera of the pelvis, and render the patient incapable of controlling the urine or fæces. In most cases of spinal meningitis both lateral halves of the cord are involved, causing all the symptoms to be bilateral; that is, involving corresponding parts on both sides of the body. In some cases, however, the disease is not equally severe on both sides. In most cases, also, as you will infer from the symptoms I have detailed, the disease involves the nerves from both anterior and posterior columns of the cord, thereby disturbing the functions of motion and sensation, at the same time. In many cases, however, the disease does not progress with equal rapidity in both columns; causing, in some, the continuance of sensibility and even hyperæsthesia after the loss of motion in the same parts is complete, and in others the order of progress will be reversed, showing complete loss of sensibility, while the muscles of the part remain rigidly contracted. When the lower part of the body and limbs are fully paralyzed, with dribbling of urine and involuntary discharge of fæces, there is much danger of the formation of large and deep bed sores over the sacrum and trochanters, with progressive loss of flesh and strength until death results from asthenia. If, as happens in a certain proportion of the cases, the attack of inflammation is less severe, the resulting paral-

ysis of either sensation or motion will be only partial, and by proper management the patient will slowly recover.

Morbid Anatomy.—The pathological and anatomical changes which take place in the different grades of spinal meningitis are the same as in the corresponding grades and stages of cerebral meningitis, already described. During the first stage, corresponding with the period of severe pain, hyperæsthesia, muscular contractions, and general fever, the pia mater and surface of the cord are intensely red from the congestion or accumulation of blood in the vessels and capillaries of the inflamed parts. This, in a time varying with the intensity of the vascular engorgement, is followed by exudations into the membrane and portions of the surface of the nerve substance, and effusions of serum, between the arachnoid and pia mater, in some cases colored with blood corpuscles, and in others rendered turbid from the intermixture of pus. It is the pressure of these accumulating products of the inflammation upon the substance of the cord, that causes the transition of symptoms from those of active irritation and excitement, to those of debility, anæsthesia and muscular paralysis, which mark the second stage of the disease. If the case has terminated fatally soon after the second, or stage of paralysis has supervened, there will usually be no other morbid appearances in the interior of the cord than slight congestion of the vessels. But if life has been protracted through a long period of time after paralysis from the continued pressure of the effused fluid and other inflammatory products on the cord, much atrophy or wasting of the nerve structure may be found to have taken place in addition to other changes. In some cases the serous effusion is less and there is plastic material in its place, both on the surface of the pia mater and between it and the substance of the cord, causing sometimes adhesions between the surfaces of the arachnoid and pia mater.

Diagnosis.—The chief diagnostic symptoms of spinal meningitis are, severe pain in some part or the whole of the spinal column, greatly increased by bending or moving the part, hyperæsthesia of the whole surface, or of such parts as receive sentient nerves from the part of the spinal cord affected; more or less contractions of the muscles supplied with motor nerves from the same source; more or less general fever as indicated by increased heat and frequency of pulse; and when the inflammation involves the middle and upper sections of the cord, the characteristic sense of constriction, as of a band around some part of the chest or abdomen. There is very generally tenderness to pressure on each side of the spinal column, but not directly on the spinous processes. Neuralgic and hysterical affections are neither characterized by general fever nor the persistent pains and muscular contractions of the first stage of spinal meningitis. From acute and subacute rheumatic inflammation it is distinguished by its fixed or non-migratory character and by its early tendency to develop more or less paralysis of sensation or motion, or of both.

Prognosis.—Acute inflammation, occupying the membranes and a large part of the surface of the cord, is a dangerous form of disease, proving fatal in a large percentage of cases. When it is limited to a small part of the cord, and especially to the lower third, the proportion of recoveries is much larger, simply because it does not involve paralysis of parts whose function is essential to the continuance of life. The longer any part of the cord remains under pressure from the exudation and other inflammatory products, the less will be the prospect of ultimate recovery. The earlier any given case can be brought under judicious treatment, the better will be the prospect of success.

Treatment.—The body should be kept in a recumbent position, as free

from motion as possible and upon one side instead of the back. In the first stage of all acute and subacute cases, free local depletion by leeches or cups, followed by frequent douches or sponging with hot water along the spine for twenty-four hours, and the subsequent application of blisters, or other means of efficient counter-irritation, will constitute the best external measures of treatment. Internally, you can give to an adult from three to six decigrams (gr. v to x) each of calomel and bicarbonate of sodium, and follow it in three hours by sufficient sulphate of magnesium, or other saline laxative, to secure a free movement of the bowels. As soon as this is accomplished, you can give one gram (gr. xv) of the salicylate of sodium in solution, every three or four hours, and a powder of calomel, six centigrams (gr. i), and the compound powder of opium and ipecacuanha four decigrams (gr. vi), between the doses of the salicylate. If the pulse is hard and quick and the temperature high, from three to five minims of the tincture of veratrum viride may be added to each dose of the solution of salicylate of sodium until the acuteness of the symptoms abate. If under the use of these remedies the temperature falls, the pulse becomes slower and more easily compressed, the pains in the back and general hyperæsthesia diminish, and especially if muscular relaxation and anæsthesia begin to appear, indicating the commencement of effusion or accumulation of inflammatory products, both the salicylate and the calomel should be omitted, and in their place from four to six decigrams (gr. vi to x) of the iodide of potassium, given every three or four hours, with efficient counter-irritation over the affected part of the spine. After the operation of the first cathartic the bowels may be moved once each day by enemas. If, prior to the attack, the patient had been anæmic, or under the influence of malaria, or other depressing agents, ergot and physostigma may be given with the salicylate instead of veratrum viride or aconite. And when the stage for using the iodide comes, it may be alternated with from two to three decigram (gr. iii to v) doses of sulphate of quinia with advantage to the patient. The treatment I have detailed is such as I have found most beneficial in the more acute and severe attacks of spinal meningitis in the adult. The same remedies are indicated in the milder cases, but they need to be less vigorously used. And in children the amount of local bleeding and the doses of medicines should be carefully adjusted to the age and vigor of the child. If the symptoms of inflammation subside without leaving any paralysis of either sensation or motion, very little further medication will be required, but the patient must remain at rest and carefully avoid undue exertion or excitement, and live on plain, easily digestible food until recovery is well established.

If, however, when all active inflammatory symptoms have disappeared some degree of paralysis remains, with soft compressible pulse, cool extremities, and general sense of weakness, there must be added to the rest, avoidance of excitement and plain nutritious food, the continuance of such remedies as will be most likely to hasten the further removal of inflammatory products and restore sensibility to the paralyzed nerves. For these purposes we have probably no better remedies than moderate doses of the iodides with an occasional pill of blue mass at night, the daily use of gentle faradic currents, and at a later period, small doses of strychnia with a teaspoonful of the compound syrup of the hypophosphites after each meal-time, and judiciously applied massage to the weakened or paralyzed parts To give the patient the best possible chance for recovery, the means I have mentioned should be patiently used for a long period of time, and the utmost care should be given to the prevention of bed sores by scrupulous cleanliness, frequent changes of position, and the aid of air

or water cushions under the parts most exposed to pressure. I next direct your attention to

MYELITIS.

By this word I mean inflammation of the interior of some part of the spinal cord without involving its surface or membranes.

Attacks of this kind are more frequent in childhood and youth than in the middle and later periods of life. It has occurred more frequently in males than females. It may arise from the same causes that give rise to spinal meningitis, namely mechanical injuries, exposures to cold and wet, excessive fatigue, to which may be added as predisposing influences excessive use of tobacco, alcoholic drinks, and indulgence of the sexual instinct. The form of myelitis that occurs in infants has been observed more frequently during the warm than the cold months of the year, and has sometimes followed attacks of the eruptive fevers, as though these exerted a predisposing influence.

Inflammation attacking the substance of the cord may be limited to the anterior, posterior, or lateral columns, or it may involve the whole. It may be limited to a small section or extend the whole length of the cord. It may vary in grade from the most acute to the most chronic form of inflammatory action. Though beginning entirely within the substance of the cord, myelitis seldom continues long without extending more or less to the surface and involving the pia mater to some extent.

Symptoms.—The symptoms of acute myelitis differ from those of spinal meningitis chiefly in the beginning of the attack. The pain in the back is more circumscribed ; the initial fever of shorter duration; and the paralytic symptoms earlier developed, but much more variable in their location. The latter depends upon the particular parts of the cord involved in the inflammation. If the inflammation attacks the anterior gray matter of the cord, as is most common in infancy and early childhood (formerly called "infantile paralysis,"* more recently Anterior Poliomyelitis,) it will be characterized by the sudden development of general irritative fever, more frequently in the night, which may vary from a very mild grade to a high degree of intensity, accompanied by restlessness, frequent pulse, hurried breathing, and dullness or drowsiness, and sometimes, though very rarely, convulsions. After a continuance of this fever for a period varying from three or four hours to two days, motor paralysis begins to be manifested in some part of the system of voluntary muscles ; most frequently in those of one or both lower extremities, constituting paraplegia and indicating that the inflammation is located in the lower dorsal or lumbar part of the cord. I have seen some cases in which the child was put in bed at night in apparent good health, and though restless and feverish during the last half of the night, but hardly enough to attract special attention, yet on being taken up in the morning both legs were found as helpless as two strings attached to the body. In other cases only one leg was paralyzed. If the inflammation is located in the anterior gray matter of the cervical or upper part of the dorsal portion of the cord, the paralysis will be likely to affect one or both arms; and a few cases have been recorded in which it involved simultaneously both arms and both legs. When the inflammation is very circumscribed or limited to a small area of the gray matter the resulting paralysis may involve only a single muscle or a set of muscles either on the trunk of the body or on the extremities. In all these cases the general febrile symptoms disappear on the supervention of the

* First well described by Heine in 1840.

paralysis, and the patients soon regain their appetites and general feelings of health, but the paralysis remains with rapidly progressing atrophy of the paralyzed muscles.

When the disease in the acute form attacks the same parts of the cord in adults, the resulting clinical phenomena are the same as in the children, except that the initial fever is accompanied by less cerebral symptoms, such as vertigo, delirium, and convulsions. When the inflammation in an acute form attacks the gray matter of the posterior part of the cord, whether in children or adults, the same general febrile symptoms accompany the first stage, but the pain in the spine is more severe and the sensory instead of the motor functions are disturbed in different parts of the body and extremities. The resulting paralysis is apt to involve the bladder and rectum, while in the cases having the anterior gray matter as the seat of the disease, these important parts are unaffected. When the disease primarily invades the gray matter of the lateral cornua of the cord, the resulting disturbances will be mostly seen in the vasomotor and trophic or nutritive functions. In those rare cases in which the inflammation invades at once all the columns or tracts of gray matter in the cord, the resulting paralysis, both sensory and motor, may be so extensive as to interfere with respiration and lead to an early fatal result.

Pathological Anatomy.—The structural changes observed as the result of acute and subacute inflammation of the substance of the cord, are the same as occur in cerebritis. First, congestion of blood in the capillaries and small vessels; second, exudation of liquor sanguinis and leucocytes into the structure, causing the walls of the vessels, the interstitial spaces, and the neuroglia of the nerve matter to be crowded with granule and fat cells; and third, swelling and proliferation of the neuroglia-cells, with disturbance or disintegration of the axis-cylinders, nerve fibres and ganglion-cells, and finally the disappearance of the nerve matter, leaving principally fat granules with hypertrophied neuroglia or connective tissue and enlarged vessels. To the unaided eye the inflamed parts present at different points a variety of colors from the deep red of the stage of congestion, reddish brown if there be extravasation; the yellow color of ordinary exudation; and finally nearly white, while throughout the whole, the parts appear more soft than natural, and sometimes almost of a creamy consistence.

Diagnosis.—The only period in the progress of myelitis, when there could be any difficulty in forming a correct diagnosis, is in the first or febrile stage, before marked changes in the sensory or motor functions have occurred. Even in this brief period, however, if the patient is old enough to express his feelings, the unusual pain in some part of the spine greatly increased by motion, should at once suggest the seat of disease. But in infants, the fever is often regarded as only evanescent or accidental until the paralysis of some part attracts attention.

Prognosis.—The prognosis in myelitis does not differ much from that of spinal meningitis. When the inflammation is located in the cervical and upper part of the dorsal portion of the cord and embraces both anterior and posterior columns of gray matter it generally proves speedily fatal from paralysis of the respiratory organs and muscles. If it is located low enough to cause only paraplegia of the lower extremities the patient may either make a complete recovery, or recover very good general health with permanent loss of motion and diminished nutrition of one or both legs, or the continued paraplegia may be accompanied by gradual impairment of the general health, the formation of bed sores over the hips and sacrum and final fatal exhaustion. The same differences in the result may

attend inflammation in limited areas or tracts of any part of the cord. As a general rule, whenever any muscle or set of muscles is so completely paralyzed as to be insensible to the galvanic current or to the tendon reflex stimulus, there is little or no prospect of the ultimate recovery of its natural function. But so long as there is some response to these stimuli, there is a prospect of recovery. In all cases nutrition goes on less rapidly in paralyzed parts than in those not paralyzed. This causes, even in adults, a paralyzed limb or muscle to soon become smaller than natural; and in children who are still growing, the disparity between a healthy and paralyzed limb becomes in a few years a marked deformity.

Treatment.—The therapeutic management of myelitis does not differ in any essential particular from that of spinal meningitis. The same remedies, used in the same manner, and carefully adjusted to the successive stages of the disease, may be used as I described in detail when speaking of the treatment of the last named affection during the earlier part of the present hour.

LECTURE XXXVIII.

Chronic Spinal Meningitis, and Myelitis, or Spinal Sclerosis: Their Clinical History, Morbid Anatomy, Diagnosis, Prognosis, and Treatment.

GENTLEMEN: Chronic inflammation of the meninges and substance of some part of the spinal cord is of more frequent occurrence than the acute and subacute forms of the disease described in the preceding lecture. It may be chronic from the beginning and arise from the same causes that produce the more active or acute form of disease, or it may be the sequel of an acute attack. The chronic form of disease may involve a complete section of the cord at any part of its length, or it may be limited to the membranes and surface of the cord, or to a part or the whole of either the anterior, posterior, or lateral columns of gray matter in the substance of the cord. And the detail of symptoms will vary in accordance with the variations in the location and extent of the inflammation.

Symptoms or Clinical History.—Chronic inflammation of a segment of the spinal cord, or transverse meningio-myelitis occurs most frequently in the lumbar and lower part of the dorsal region, and next in the cervical portion. When in the former it is characterized by persistent pains in the loins, increased by bending or motion of the part; sharp, irregular pains in the course of the nerves supplying the lower extremities, often accompanied by muscular twitchings, cramps, or persistent rigidity; sensations of numbness, prickling, and sometimes heat, especially in the feet and parts below the knee. The general symptoms are slight increased frequency of pulse; inactive condition of the bowels; a variable condition of the urine, being sometimes scanty and red and at others abundant and clear when voided but on cooling depositing a white sediment of ammoniacal or phosphatic salts. The muscles most affected are generally the gastrocnemii and soleus by the contractions of which the heel is drawn up and the toes strongly flexed. If the disease extends upwards (sclerosis ascendens) it will involve in its course the anterior crural and spermatic, causing

pains and muscular contractions in the anterior part of the thigh, the psoas and iliacus internus, as well as the testicles and cremaster muscles. At the same time there is liable to be difficulty in regulating the passages from the bladder and rectum. The patient may continue in the condition I have described from two weeks to as many months, when the moderate general febrile symptoms disappear, the pains gradually give place to complete anæsthesia or loss of sensibility, and the muscular contractions to entire relaxation, constituting loss of both sensation and motion or complete paraplegia of the lower extremities. If the disease does not extend above the level of the lower dorsal vertebra, the patient may continue in this condition of paralysis of the lower extremities and enjoy fair general health many months or even years. If the inflamed segment of the cord be in the neck, it will cause the same succession of changes in the muscles and nerves of the trunk of the body and of the upper extremities, ending in general spinal paralysis and death. But much the larger number of cases of chronic inflammation of the spinal cord involve, not a segment of the whole cord, but only one, or even part of one of its columns. If it involves the anterior column of gray matter it is described by different writers under the names of anterior spinal sclerosis, anterior poliomyelitis; chronic atrophic spinal paralysis; and progressive muscular atrophy. If the posterior column of gray matter is the seat of disease, it is called posterior spinal sclerosis, posterior poliomyelitis; progressive locomotor ataxia, and tabes dorsalis. When located in the lateral columns or cornua, it has been designated lateral spinal sclerosis, spastic spinal paralysis (Erb.), spasmodic tabes dorsalis (Cheviot), and tetanoid pseudo-paraplegia (Seguin). These numerous names used by different writers are well calculated to confuse and mislead the student, rather than to add to his knowledge of diseases. I shall therefore use only the simple designations, anterior, posterior, and lateral spinal sclerosis to distinguish chronic inflammation as limited to one or the other of the three principal longitudinal divisions of the cord.

When the disease is limited to the anterior column of the cord (anterior spinal sclerosis), the chief symptoms are presented in some part of the system of voluntary muscles, more frequently in those of the arms, shoulders, and chest, but often extending at a later period to those of the lower part of the trunk and lower extremities. This order is in many cases, however, reversed—the muscles of the lower extremities being affected first. The distinctive symptoms are, pricking pains in the affected muscles, fibrillary trembling of particular bundles of muscular fibres, progressive atrophy or wasting of the muscular structure, and loss of contractility or paralysis. In some cases there are coincident pains or rather morbid sensations of restlessness in some part of the back, general feelings of weakness, but no febrile phenomena, and but little derangement of the secretory functions. The progress of the disease as indicated by the symptoms is very variable. In some cases it may reach such a degree of muscular atrophy and paralysis as to fatally impair the respiratory movements, causing death by apnœa, in a few months; while in others it may require as many years. When the disease is the sequel of an acute attack, the progress is usually more rapid and more generally progresses from the muscles of the lower extr mities upward to those of the trunk of the body and finally to those of the shoulders and arms. There is another class of cases which have not been preceded by any acute or active symptoms, but which develop mostly in individual muscles, often unconnected with each other, as the pectoral, the deltoid, the dorsal interosseous, the muscles of the ball of the thumb, the serratus, latissimus dorsi, etc. In some cases

parallel muscles are affected simultaneously on each side of the body, and in others they follow in successive order.

In some stages of the progress of these cases the patients present a peculiar and most striking appearance. For instance the muscles of the neck, shoulders and chest may be so completely atrophied as to leave the outline of each bone as distinct as in the naked skeleton, while those of the fore-arms, hips and legs are as full and well nourished as ever. The class of cases I have just been describing have been more especially designated by many as cases of *progressive muscular atrophy*, in which the disease was primarily located in the muscles, and the gray matter of the anterior column of the cord became involved secondarily. This view was adopted and maintained with much ability by Friedreich, of Berlin, in 1873. But whether the disease commences primarily in the muscles or in the anterior gray matter of the cord, it is certain that both become seriously affected during its progress.

When the disease is confined to the posterior column of the cord (posterior spinal sclerosis, progressive locomotor ataxia) it is most generally located in the cervical portion, but sometimes follows longitudinal tracts as low as the lumbar region of the spinal cord. It may also extend in certain tracts through the medulla oblongata to the base of the brain. The characteristic symptoms are manifested chiefly in alterations of sensibility in different parts of the periphery of the body, and in impairment of the co-ordination of muscular movements.

There are generally pains in the limbs, sometimes in circumscribed places on different parts of the body, accompanied at first by hyperæsthesia; and at a later period, anæsthesia or analgesia; occasionally dimness of vision ; frequent turns of indigestion with some constipation ; inactivity of the pupil under changes in the degree of light; unsteadiness of gait with difficulty of going up steps except by a special jerking or springing movement, and inability to walk in the dark. As the disease advances the loss of sensibility in some parts, more especially in the soles of the feet, is more complete ; the difficulty of locomotion or walking becomes so great that the hands must constantly rest upon something to aid in steadying the movements, not because any of the muscles are paralyzed, but for want of co-ordination in their action; in some cases either retention or incontinence of urine ; loss of control over the act of defecation; and entire inability to walk or stand upright without support. Early in the disease the tendon reflex and the ankle-clonus are notably diminished; and at a later period lost. In the early stage, the pulse is moderately increased in frequency, but diminished in force, and in the later stages of many cases, it becomes weak and irregular ; while the temperature seldom varies materially from the normal standard. The progress of the disease is generally slow; and its duration may vary from six months to twenty-five or thirty years. It occurs most frequently in the middle period of adult life ; and much more frequently in males than in females.

When the chronic inflammation is confined to one or both lateral columns of gray matter (lateral spinal sclerosis, spastic spinal paralysis, tetanoid pseudo-paraplegia,) and occurs as a primary affection, it is generally located at the posterior border of the lateral columns proper, and in what is called the crossed pyramidal columns of Flechsig, but in its progress may include the larger part of the lateral columns. The symptoms which characterize the commencement of this disease, are a sense of weight or heaviness in the upper or lower extremities and sometimes in both, with great sense of weariness unusually increased by even moderate exercise. In a little time the weakness amounts to paresis or partial paralysis

of certain muscles, more frequently of the legs, with slight twitchings or tremors, and some stiffness or temporary rigidity following contractions, as though the fibres of the contracted muscles could not relax in the usual time. For instance in walking, as the body moves forward to the point where the weight rests on the ball of the toes with the heel up, the failure of the muscles to relax at the proper moment, keeps the toes down until the patient may be in danger of falling forward, and gives him a peculiarly stiff and jerky gait. At this stage, both tendon reflex and ankle-clonus are much increased, being the reverse of their condition in the anterior spinal sclerosis. But there is neither muscular atrophy nor impairment of the functions of the bladder, rectum or sexual organs as occurs in the posterior spinal sclerosis. Still the symptoms I have enumerated as characteristic of the lateral sclerosis continue slowly to increase until the patient loses all power over the extremities, upper and lower, and many of the muscles remain in a state of rigid contraction, constituting an entirely helpless condition. In this state he may live many years, the mental faculties and nutritive functions remaining active and efficient, until some other disease supervenes to cut life short. The same grade of disease may extend to, or primarily attack the motor nuclei of the medulla oblongata, causing pains in the neck at the junction with the back of the head and sometimes dizziness; slowness of speech and mastication, with drooping of the lips and angles of the mouth, allowing dribbling of saliva; and a little later, difficulty of deglutition, great feebleness of voice, and sometimes distressing paroxysms of dyspnœa. While retaining the mental faculties and general sensibility unimpaired, all the disabilities I have named continue to increase until the ability to swallow is entirely lost, and the patient is in danger of death from ultimate starvation. When the disease develops thus, in the tracts of medulla I have named as a primary affection, it constitutes the *glasso-labio-laryngeal paralysis* of Trousseau, or the *Bulbo-nuclear sclerosis* of other writers. While most of the cases of lateral spinal sclerosis affect both lateral parts of the cord at the same time, and consequently involve the muscular movements in both arms or legs coincidently, there are some instances in which the disease is unilateral, and others in which the disease in one side follows after that in the other. It is proper to state also, that lateral spinal sclerosis in its progress often extends into some parts of the anterior columns of gray matter, causing the case to be complicated with more or less of the symptoms of anterior spinal sclerosis. This constitutes what has been described by Charcot, as "Amyotrophic lateral sclerosis," but better termed antero-lateral sclerosis. The same may be said in regard to the extension of lateral sclerosis posteriorly into the posterior column of gray matter, by which the symptoms of lateral sclerosis become more or less complicated with those of locomotor ataxia and may be distinguished as posterio-lateral sclerosis.

Again, cases are met with in which there is more or less intermingling of symptoms belonging to sclerosis of all parts of the cord and medulla. These have been designated as multiple or disseminated spinal sclerosis. They may present the paresis or weakness and dragging of the limbs, followed by twitching or trembling, as in lateral sclerosis; with the pains and varied conditions of nerve sensibility belonging to posterior spinal sclerosis; and the well marked atrophy of some of the muscles as in anterior sclerosis. These multiple or mixed cases may present a great variety of symptoms and phases, according as one set of symptoms or another predominate.

Morbid Anatomy.—While chronic inflammation or sclerosis in different

parts of the spinal cord, gives rise to different symptoms, according to the functions of the part involved, yet the molecular or structural changes which take place during its progress are substantially the same in whatever parts it may be developed. These changes are, first, dilation of the capillaries and smaller vessels, with exudation or permeation of their walls by leucocytes and other elements of the blood, followed by hyperplasia from enlargement and proliferation of the cell elements; and second, similar hyperplasia of neuroglia, nerve-sheaths, and reticular or connective tissue, and corresponding atrophy and disappearance of the nerve-cells and medullary matter of the nerve tubules, leaving the axis-cylinders either of normal size or even hypertrophied. These changes, which are apparent fully, only when the structure is properly prepared and examined under the microscope, give to the sclerosed part greater density or hardness, which is apparent to the touch or when cutting through it, and to the eye shows a gray or yellowish gray color, and sometimes, after exposure to the air, a redder tint. The cut surface has a smooth, even appearance, and there exudes from it only a small quantity of transparent fluid. In the anterior spinal sclerosis these changes will be found chiefly in the anterior gray matter of the cord, and in some cases extending to the anterior roots of the spinal nerves. In the posterior and posterio-lateral sclerosis they are found in some part of the gray matter of the posterior column, more generally in its cervical portion, and in the posterior roots of the spinal nerves; while, in some cases, they are found as low as the lumbar part, and in others as high as the base of the brain. In the lateral spinal sclerosis, the altered patches or tracts of the cord are found mostly in the posterior margin of the lateral column; while in the complex or multiple cases of sclerosis, patches of sclerosed structure will be found in all divisions of the cord, often very irregularly or unequally distributed. For details as to the best methods of preparing specimens and examining them under the microscope, I must refer you to my colleague in the chair of pathology and pathological anatomy, or to the text-books in that department.

Diagnosis.—The chief symptoms characteristic of sclerosis of the several parts of the spinal cord I have already pointed out with sufficient emphasis in giving their clinical history. From corresponding forms of disease in any part of the brain, they are distinguished by the absence of direct cerebral symptoms and the restriction of morbid phenomena to the muscles and parts supplied with nerves from the spinal cord.

From all the varieties of functional and reflex disturbances of the nervous system, they are distinguished by their gradual development, persistent progress, and in most cases by their involvement of progressive atrophic, or wasting nutritive changes in the muscular structures connected with the diseased portions of the spinal cord. In the purely lateral sclerosis in which there is not marked muscular atrophy, but often quivering and trembling of muscles after voluntary movements, there may be danger of confounding it with paralysis agitans or shaking palsy.

The latter, however, exhibits a much finer and more purely tremulous motion, commencing and continuing without the slightest connection with voluntary motion; while the shaking of lateral sclerosis is a coarser motion, chiefly accompanying and following voluntary movements, and manifesting itself quite as often in irregular motions of the head as of the hands or feet.

Prognosis.—When spinal sclerosis has become well developed in any part of the cord it is seldom cured by any process of treatment. And yet cases have occurred in which recovery took place when the symptoms were

so strongly characterized as to leave no reasonable doubt concerning the correctness of the diagnosis. A few such cases, more particularly of the posterior spinal sclerosis—progressive locomotor ataxia—have come under my own observation. The earlier chronic inflammation in any part of the cord is detected and brought under judicious treatment the better is the prospect of success. The slowness of development and the equivocal character of the earlier symptoms of this form of disease, cause the real nature of many cases to pass without recognition until the changes of structure have become permanent. As constitutional syphilis and habitual use of alcoholic drinks are among the more frequent and recognizable causes of spinal sclerosis, it is highly probable that an early and correct diagnosis accompanied by the use of proper sanitary measures and remedial agents would arrest the further progress of the morbid action in a large proportion of the cases, and thereby postpone the development of the more distressing symptoms for many years. So long as the sclerosis does not involve those parts of the medulla oblongata controlling respiration, or of such parts of the cord as are connected with urination and defecation, life and a fair degree of health may be continued from five to fifty years; or until the patients die from some intercurrent disease. Dr. J. W. Holland recently reported to the Louisville Medico-Chirurgical Society three cases of disseminated or multiple sclerosis of the spinal cord in one family, which consisted of one brother and four sisters, the brother and two of the sisters being affected with the disease, while the other two are exempt. In the brother the first symptoms of disease were manifested when he was twelve years of age, and have now been slowly progressing fifteen years. The two sisters began to be affected when eleven years of age, and in one it has continued six years and in the other two years.* Both parents and the other two sisters are free from all symptoms of spinal disease, and no cases were known to have occurred in the ancestry. The occurrence of three cases in one family, all commencing at nearly the same age, and that so early as the eleventh and twelfth years is very unusual.

Treatment.—Although the treatment of all varieties of spinal sclerosis or chronic myelitis, has failed to effect a cure in the great majority of cases, yet there are certain rational indications to be fulfilled, which, if judiciously attended to through a long period of time, will greatly mitigate the suffering of the patients, prolong their lives, and occasionally result in a positive recovery.

In the earlier stage while there is pain, hyperæsthesia, or disturbance of muscular action, indicating that the nerve-cells and medullary matter are not altogether lost but still retain a degree of structural integrity, the leading objects of treatment are, to overcome the morbid excitability of the structure and thereby lessen the pain and muscular rigidity or irregular muscular contractions; to arrest the morbid molecular movements by which the connective tissue of the part is becoming hypertrophied from hyperplasia or excess of nutrition and the contained nerve matter atrophied; and to so regulate the habits, mental and physical, as to avoid the further action of either the predisposing or exciting causes. To accomplish the latter, the patient should be required to avoid all use of alcoholic beverages, whether fermented or distilled; all use of tobacco; and all sexual indulgences.

He should live on plain, easily digestible, and nutritious food, including meat with tea and coffee, rather sparingly. You should also enjoin much

* See Louisville Medical News, Vol. XIV., No. 363, p. 288, Dec, 9, 1882.

rest in the recumbent position. If the patient is capable of taking any exercise out-doors, let it be mostly passive by riding, never allowing long walks or long standing at one time. And it is an important rule to have the patient place himself fully at rest in a position to give the whole system of voluntary muscles as complete relaxation as possible, after every effort at physical exercise or exertion. My own clinical observations lead me to think that this rule in regard to full rest, is deserving of more attention than it has generally received in the management of this class of diseases. If the case comes under your care quite early in the progress of the disease, you will often derive advantage from efficient dry cupping over the spine every third day for two or three weeks, with frequent sponging of the back with tepid water during the interval between the cuppings. The severer forms of counter-irritation by blisters, setons, issues, moxas, and the hot iron have all been used freely in many cases, but without material benefit. In a few cases, I have followed the dry cupping and hot water sponging by a succession of small blisters, with some benefit; and have followed these by the use of the camphorated soap liniment, holding in solution six centigrams (gr. i) of veratria to each thirty cubic centimeters (fl. ℥i) of the liniment, applying it freely over the spine each morning and evening. To fulfill the two indications first named, we need the influence of such anodynes as will lessen morbid sensibility without checking the necessary secretions and evacuations, combined with some efficient alterant capable of diminishing the exaggerated play of vital affinity by which the molecular movements constituting cell-proliferation and hyperplasia of the connective tissue in the diseased parts are regulated. The anodynes best adapted to fill the requirements specified are the stramonium, hyoscyamus, and conium; the opiate preparations, though more efficient as anodynes, being too liable to produce constipation and to diminish many of the secretions. The most reliable alterants are the bichloride of mercury and the iodides. And during the same period of time that I have advised dry cupping and hot water sponging externally, I have been in the habit of giving internally a combination of the bichloride of mercury and iodide of sodium with the tinctures of stramonium or hyoscyamus and either the cimicifuga racemosa, phytolacca decandra, or senecio aureus, as in the following formula:

℞			
	Hydrargyri Chloridi Corosivi	0.1 grams.	gr. 1½
	Sodii Iodidi	15.0 "	℥iv
	Tincturæ Stramonii	15.0 c.c.	℥iv
	Tincturæ Phytolaccæ Decandræ	75.0 "	℥iiss
	Elixer Simplices	60.0 "	℥ii

Mix. Give to an adult four cubic centimeters (fl. ℥i) in a little additional water each morning, noon, tea-time and bed-time. After two or three weeks I usually limit the use of this combination to one dose in the morning and evening, and commence giving, after each meal-time, some one of those remedies that are supposed to promote general nutrition, such as the syrup of lacto-phosphate of calcium; the compound syrup of the hypophosphites of sodium, calcium, and iron, etc., in conjunction with the phosphide of zinc. If at any time the gums or breath show any indications of the mercurial action, I immediately omit both the bichloride of mercury and the iodide of sodium, and supply their place with fair doses of the iodide of potassium.

If the bowels fail to move regularly they should be aided by enemas or mild laxatives. Unless I have erred much in my diagnoses, I have seen

a considerable number of cases of true chronic myelitis, affecting different parts of the spinal cord, recover, in which the foregoing management was commenced soon after the characteristic symptoms were manifested, and was continued with steadiness and perseverance for many months.

If, however, either from the late stage at which the case comes under your care, or in spite of the foregoing or any other treatment, you find the pain and hyperæsthesia giving place to anæsthesia, and muscular contractions yielding to motor paralysis with increasing atrophy of the affected muscles, you may add to your remedial measures the daily use of mild galvanic currents in connection with friction and massage, continued from ten to twenty minutes each day, with a reasonable expectation of retarding the progress of the disease, and rendering the patient more comfortable if you can not effect a cure. One of the obstacles to your success in the treatment of these slow chronic affections of the spinal cord, will be that impatience and restless desire to see speedy results, which often induces both patient and physician to make such frequent changes from one remedy, or one method of treatment, to another, that no one agent or process is continued long enough to give a fair opportunity for developing its effects either for good or evil. Another obstacle of importance will be a tendency, encouraged by much of what is published in the current medical literature, to try *specific* remedies more or less indiscriminately, instead of endeavoring to carefully appreciate the exact pathological conditions and stage of progress in each case, and selecting and adjusting remedies thereto on rational principles guided by a knowledge of the *modus operandi* of the remedial agents selected. My remarks thus far, gentlemen, have relation to the management of chronic inflammation during its progress, and before the morbid process called sclerosis is complete. But when the cases coming under your charge have advanced so far that paralysis of either sensation or motion, or both, is complete, and the muscular structures involved greatly atrophied, indicating entire disintegration or disappearance of the nerve structure in the sclerosed patches or nerve tracks, there is left no reasonable hope of recovery; and the only rational indication for treatment is to so regulate the diet and hygienic surroundings of your patients, with such careful attention to the palliation of symptoms, the prevention of bed sores, the securing of proper evacuation from bladder and rectum, as will render them most comfortable, and best contribute to the maintenance of general health. Yet, it is best not to be too positive in pronouncing particular cases hopeless. For I well remember a case of well marked locomotor ataxia or posterior spinal sclerosis that came into my wards of the Mercy Hospital a few years since. The patient was a working man, about thirty-five years of age, who had been much exposed to cold and wet, and was somewhat addicted to the use of alcoholic drinks. The symptoms of locomotor ataxia had been progressively developing for three months before his admission to the hospital. The diagnostic symptoms of the disease were at that time so complete, that he was several times presented to the clinical class for illustrating the progress of typical cases of that affection. I subjected him to steady treatment for three months, embracing in succession, alteratives, tonics, nutrients, electro-magnetic currents, and judicious diet; but rather encouraged him to try to walk every day a few minutes at a time, which was doubtless an error. At any rate he steadily failed until at the end of the three months he could not walk a step or stand upon his feet without an assistant on each side to hold him up.

Thinking further special treatment of no use, he was directed to desist from all efforts to maintain an upright position even long enough for the making up of his bed; but to have strict attention given to cleanliness,

frequent changes of position in bed to avoid bed sores, proper attention to his evacuations, a plain nutritious diet, and no medicine except at each meal-time eight cubic centimeters (fl. ʒii) of a mixture of two parts of a thick syrup called extract of malt and one part of compound syrup of hypophosphites. He was left entirely at rest under these directions, expecting him to continue failing until a fatal result was reached. But much to my surprise after about three months of this rest, he began to make efforts to help himself, and in another month could get out of bed and stand alone, and finally so completely recovered that he left the hospital with a steady firm step and gait in walking, and in fair general health. I relate the case, first to show that patients sometimes recover from conditions of chronic disease which render their cases apparently hopeless; and secondly to illustrate the value, in some cases at least, of entire and protracted rest in the recumbent position.

Neuritis.—Both the sheaths and substance of the various nervous cords are liable to attacks of inflammation in all degrees of activity. Specimens of this are seen most frequently in the roots of the spinal nerves, the trunk of the sciatic, and in the tri-facial, than elsewhere. The inflammatory process almost always partakes of the rheumatic character, and is most readily relieved by anti-rheumatic treatment, aided by narcotic fomentations in the first stage, and subsequently blisters over the affected nerves. I have now completed the consideration of inflammations of the nervous apparatus, so far as the time allotted to our present course will permit.

LECTURE XXXIX.

Inflammation of the Respiratory Organs; The Several Structures included under this Head, and their ubdivisions—Historical and Etiological Considerations.—Acute and Chronic Inflammation of the Naso-Pharyngeal Membrane; Their Symptoms, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The organs immediately concerned in the process of respiration, are the nasal, laryngeal, tracheal and bronchial tubes, the parenchyma of the lungs, and the pleura covering the latter. Considered in regard to the inflammations we are about to study, they are composed of three important structures, namely: The mucous membrane lining the tubes and over which the air has to pass in going to and from the air-cells of the lungs; the parenchyma of the lungs; and the serous membrane called pleura, which not only forms the outer covering of the lungs, but also constitutes the lining of the walls of the chest. Each of these structures are liable to attacks of inflammation separate from the others, and in each the inflammatory process is modified in its progress and results by the peculiarities of structure and function belonging to each part. In this connection I might mention a fourth structure consisting of the muscular and fibrous layers of the bronchial tubes which are sometimes the seat of inflammation, as you will learn hereafter.

History.—Inflammation located in the respiratory organs, has been recognized as a frequent and serious form of disease from the earliest periods of medical history; both as an idiopathic affection and as a complication of most of the acute general diseases. It was not until the latter part of the

eighteenth century that any considerable attempts were made to differentiate between inflammation in the membranous structures and in the parenchyma of the lungs. And even those attempts were attended by only a limited degree of success until after Lænnec had constructed a stethoscope and directed the attention of the profession to the application of the knowledge of the laws governing the production and transmission of sounds to the study of the clinical phenomena of pulmonary diseases.

Since that period of time, the familiar practice of auscultation and percussion, added to the study of the general symptoms, has rendered the diagnosis of disease in any part of the respiratory organs as exact as that of any class of diseases to which the human system is liable. You have already acquired, in connection with the courses on general pathology and clinical diagnosis in the hospital and dispensary, during the second year of your studies, such a degree of familiarity with the whole subject of physical diagnosis as to render any elementary consideration of that subject unnecessary at this time. I shall proceed, therefore, directly to the consideration of the different grades of inflammation affecting the several structures of which the respiratory organs are composed, in the following order: First, those of the mucous membrane; second, those of the parenchyma of the lungs; and third, those of the serous membrane or pleural covering of the lungs. For more convenient and accurate description, those of the mucous membrane may be divided into such as affect the lining of the nasal passages or Schneiderian membrane; the lining of the larynx and trachea, and the lining of the bronchial tubes. As all these sections of the mucous membrane are constantly exposed to contact with the inhaled air, containing whatever impurities may be suspended in it, and almost constantly varying in its temperature, moisture, and electric states, so we find some degree of inflammation affecting them, more frequently, perhaps, than any other structures in the human body. And, as a general rule, their frequency in any given locality with an equal population, will be in a direct ratio to the frequency and severity of the atmospheric changes. Consequently you will find them most prevalent in those parts of the temperate zone, the climate of which is characterized by frequent and extreme changes in temperature, coupled with a high degree of atmospheric moisture and severe winds. For the same reason you will meet them most frequently in the cold season of the year, or, more accurately, during the last half of autumn and the first part of spring, when the atmospheric vicissitudes are most sudden and severe. The parts of our own country in which these characteristics of climate and season are most prominent, are embraced in the belt or zone lying north of the 40th parallel of latitude, and extending from the Atlantic Coast to the foot or eastern border of the great mountain ranges that separate the waters which flow into the Atlantic and Gulf of Mexico from those flowing into the Pacific Ocean. On the other hand, they are least prominent in the belt or zone lying south of the 33d parallel of latitude, and on the Pacific Slope, west of the great mountain ranges just mentioned. The prevalence of inflammations of the parenchyma of the lungs and of the serous membrane covering them, follow a different rule or law. Instead of being most prevalent in those climates characterized by a predominance of the cold season over the warm, accompanied by the most frequent and extreme changes in the thermometric and hygrometric conditions of the atmosphere, they occur most frequent and most severe where the summer heat is long and high and the winter short, yet giving some days of very low temperature, thereby making a wide range between the hottest days of summer and the coldest of winter, with a predominance of summer heat.

This, in the United States, corresponds with the middle climatic belt or zone, bounded on the north by the 39th and on the south by the 33d parallel of latitude, and extending from the eastern foot of the Rocky Mountain chain to the Atlantic Coast. From these general remarks, I come now directly to the separate study of the

INFLAMMATIONS OF THE MUCOUS MEMBRANE OF THE AIR PASSAGES.

Etiology.—As the same causes tend to produce inflammation in all parts of the respiratory mucous membrane, it will economize time and avoid repetition to study them in their relations to the whole extent of the membrane at once. They may be divided into two classes: predisposing and exciting. The first embrace all agents and influences that are capable of rendering the mucous membrane of the air passages more susceptible to impressions. This may be done by directly increasing the irritability of the structure, or by altering the quality of the blood and lessening the tone of the smaller vessels. The second embraces such agents and influences as are capable of so increasing the irritability of the membrane, coupled with such alteration in the action of the blood-vessels as to induce a direct accumulation of blood in the capillaries of the part.

The most common and important of the predisposing causes may be grouped under the heads of age, occupation, modes of life, or personal habits; climatic conditions, and season of the year.

Age.—A careful examination of the statistics of mortality resulting from inflammations of the membrane lining the air passages, has led to the inference that childhood and old age are much more susceptible to attacks of this form of disease than the middle period of adult life. Consequently, nearly all your text-books on practical medicine represent childhood and old age as exerting a decided predisposing influence in favoring attacks, while the active period of adult life is comparatively exempt. A more extended examination of the subject, however, has shown that of a given number of attacks at different periods of life, a very much larger ratio of deaths result in early childhood and old age than in the middle period of life. Indeed, this increased ratio of mortality at the two extremes of life, in proportion to the whole number of cases, is sufficient to account for the results shown by the mortuary statistics, without supposing that the number of cases occurring in middle life are any less in proportion to the number of persons than in childhood or old age. On the contrary, my own records of cases of acute diseases, without regard to the mortality, show a larger ratio of attacks of inflammation in some part of the mucous membrane of the air passages, between the ages of fifteen and thirty years, than at any other period of life. I am now speaking of the inflammatory attacks as they occur independently, and not as complications of some of the acute general diseases, such as epidemic influenza, typhoid fever, measles, etc.

Occupation.—You will find all such occupations as confine those pursuing them much in-doors, to strongly predispose to attacks of catarrhal inflammation in the air passages. And if the air of the rooms occupied is kept at a temperature either too high or too low, the predisposition will be much increased. Habitual exposure to a warm and confined atmosphere, by inviting free exhalations from the membranous surfaces and increasing their susceptibility, renders them more sensitive to all external impressions. On the other hand, much confinement in rooms at a low temperature, represses the exhalations from the cutaneous surface, thereby causing the retention of some of the products of tissue changes in the blood, which renders the individual more susceptible to attacks of inflam-

mation in any of the structures of the body on the supervention of an exciting case.

Personal Habits.—For the reasons just stated, the wearing of too much or too little warm clothing, also either increases the relaxation and susceptibility of the skin and respiratory membranes from the former, or holds the cutaneous exhalations in check and increases the retention of waste and irritating material in the blood from the latter.

Another error of importance is the unequal adjustment of clothing to different parts of the cutaneous surface. On children, especially, you often see an abundance of warm clothing over the whole body, while the legs and feet and neck have but a single covering and sometimes none. And even adult women often go out loaded with warm clothing, while their feet and ankles are protected only by thin shoes and stockings.

Climatic Conditions.—It is universally conceded that inflammation of all parts of the mucous membrane lining the air passages, prevails most in such countries as are characterized by a cold, damp, and variable climate. This can be well illustrated by comparing the prevalence of this class of diseases in that belt of our own country lying north of the 39th parallel of latitude and east of the Rocky Mountains, with the prevalence of the same diseases in the belt south of the 33d parallel and bordering upon the Atlantic and Gulf of Mexico. In the former the summers are comparatively short with brief periods of high temperature; the winters cold; and the transition seasons, spring and autumn, long and exceedingly variable with a predominance of cold and dampness. In the latter, all the conditions just mentioned are substantially reversed.

Perhaps the earliest reliable statistics we have bearing upon this subject, are those collected by Dr. Samuel Forrey from the several military posts occupied by the United States Army, and given in a series of articles in the American Journal of Medical Sciences, and subsequently in an octavo volume, on the climate of the United States and its influence over the prevalence of diseases. The valuable facts presented by Dr. Forrey were added to by Dr. Daniel Drake and given in full in his large work on the topography and diseases of the great interior valley of this continent. From these sources you can learn that the average annual number of attacks of inflammation of the mucous membrane of the respiratory passages in every 1,000 soldiers at Fort Snelling, in Minnesota, lat. 44° 53′ N., was 600. At Fort King, fifty miles from the Gulf of Mexico, lat. 28° 58′ N., the annual number of attacks average only 101.2 in every 1,000 persons. Again, at Madison Barracks near Sackett's Harbor, in New York, the average number of attacks for every 1,000 persons was 637.2; while at Key West, in Florida, the average number of attacks was 208.9, and at Baton Rouge, Louisiana, only 207.2. Dr. Drake after a laborious comparison of the statistics at all the military posts in the great interior valley from Fort Snelling at the north to Fort Jessup in Louisiana, the most southern, makes the "ratio of decrease in bronchial inflammations" as we pass from the north to the south as 51.5 for each degree of latitude.* A similar comparison of the statistics of all the posts on the Atlantic Slope from Madison Barracks to Key West will give you nearly the same result.

A study of these same military statistics, representing the mean ratio of the prevalence of diseases of the respiratory passages for a period of ten years at nearly all the posts, will justify some other inferences of interest beside the one just stated. According to this general inference or rule,

* See a Systematic Treatise on the Principal Diseases of the Interior Valley of North America, etc., etc, Second Series, pp. 795–6.

the three important factors in the climates most favorable for producing inflammations of the air passages are cold, variableness, and dampness; the latter being emphasized by most writers as of predominating influence. Yet the tables to which I am directing your attention show that the highest ratio of prevalence of inflammatory attacks of the mucous membrane of the respiratory passages in the northern part of the interior valley, was at Fort Snelling, in the immediate vicinity of St. Paul, Minnesota, being 600 attacks for every 1,000 soldiers; while the lowest ratio was at Fort Dearborn, on the site now occupied by the city of Chicago, being only 102 for every 1,000 soldiers. Looking at the posts in the eastern part of the northern belt of country, Madison Barracks, at Sackett's Harbor, at the eastern end of Lake Ontario, gives a ratio of 637 attacks for every 1,000 soldiers; while Fort Niagara at the mouth of Niagara River near the western end of the same lake, gives a ratio of only 355. Again turning to the posts in the southern belt of country the tables show at Fort Jessup in the interior of western Louisiana, a ratio of 432.8; while at Fort Jackson the ratio was only 47.5, and at Fort King 101.2. As Fort Snelling is on the high rolling prairie of the interior of Minnesota, noted for its cold and *dry* air, and Fort Jessup on the elevated, arid plateau between the head waters of the Sabine and the Red river, they cannot be noted for a high degree of atmospheric moisture. On the other hand, Fort Dearborn was located near the mouth of the Chicago river, on the site now occupied by this city (Chicago), which was then a low and wet prairie with a sub-stratum of impervious clay, giving all the conditions favorable for the prevalence of a high degree of atmospheric moisture. And Forts Jackson and King were both on low alluvial lands only fifty miles from the Gulf. Again, Fort Niagara is surrounded by all the conditions favoring a high degree of atmospheric moisture certainly equal to those surrounding Madison Barracks in nearly the same latitude; and yet the ratio of attacks in the latter was nearly double those in the former. It will be evident to you, therefore, that there must exist some important factor in the climatic relations of the inflammatory affections of the respiratory passages, besides temperature, humidity, and changeableness. A glance at the topography of the whole country will show you that each of the posts giving a high ratio of attacks, namely, Madison Barracks and Forts Snelling and Jessup, to which may be added Forts Gratiot, Crawford, and Wood, are so located as to be exposed to the prevalence of unusually severe winds or atmospheric currents either from the north-east up the valley of the St. Lawrence to Madison Barracks, or the north-west and west to Forts Snelling and Jessup, with certain relations to high mountain ranges in the west and ocean currents in the east. That the high ratio of attacks of catarrhal affections at Madison Barracks is largely due to the influence of the winds I have alluded to, is corroborated by the fact that the same diseases are much more prevalent in the province of Quebec, through which the valley of the St. Lawrence extends, than in the province of Ontario, as shown by the Register General's report in reference to the several military posts in the Canadas.

And it is equally evident that the high ratio of prevalence of the same diseases at Forts Snelling, Crawford and Jessup is also largely due to the cold and strong atmospheric currents that sweep over the plains from the north-west and west with such force as to justify the popular title of "blizzards." I may safely say, therefore, that the force and direction of atmospheric currents have quite as much to do with the development of inflammations of the air passages, as either temperature or humidity.

Season of the Year. — As might be inferred from what has already been

said in relation to the influence of climatic conditions, those parts of the year characterized by low temperature, high winds, and frequent thermometric changes are accompanied by the highest ratio of prevalence of inflammations of the respiratory passages. This is fully shown both by the statistics compiled from the records of all the military posts by Dr. Drake,* and by the results of clinical records kept under my own observation through a series of years.

Exciting Causes. — Exposure to sudden and extreme changes in atmospheric temperature from warm to cold, is almost universally regarded as the chief exciting cause of inflammation in any part of the mucous membrane of the air passages. More accurate and detailed observations, however, show that such changes of temperature are seldom productive of diseases of this class unless accompanied by coincident high winds and humidity. My own studies concerning the relations between special meteorological conditions, and the prevalence of particular diseases have led me to the following conclusions in regard to inflammation of the mucous membrane of the air passages.

First. Many sporadic cases are caused at any and all seasons of the year by exposure of limited portions of the cutaneous surface to cool or cold currents of air, while the rest of the body is well protected.

Second. The sudden transition from a protracted period of intense dry cold, to a higher temperature with increased atmospheric humidity. Almost every winter season in the northern belt of the United States east of the Rocky Mountains, is characterized by several periods of steady dry cold air, varying from one to three weeks in duration, during which the mercury in the thermometer often descends more than 20° C. (8° to 10° F.) below zero, and which generally end in a sudden change in the direction of the winds, and a marked elevation of temperature, constituting what is popularly called "*a thaw.*" Such changes are very uniformly accompanied by a general prevalence of catarrhal affections of the air passages.

Third. The occurrence of those cold north-east winds that, during the latter part of autumn and early part of spring, so often sweep over the whole extent of our Atlantic coast, and press up the valley of the St. Lawrence to the great interior lakes; and the still more severe currents that come during the same seasons from the north-west and west over all the wide plains that intervene between the great mountain chains to the west, and the upper lakes and Mississippi river to the east, are also accompanied by a high ratio of prevalence of the diseases now under consideration. Most of these severe storms of wind are accompanied by either snow or rain, and a marked increase of ozone or active oxydizers. In some of the severe snow storms from the north-east occurring in the latter part of February and in March I have found an unusual amount of free ammonia. Whether either the ozone or the ammonia has anything to do with the production of the catarrhal affections remains to be determined by more exact observations and records.

Acute Inflammation in the Nasal Passages.—Acute and subacute inflammation in the Schneiderian membrane, more familiarly known as acute nasal catarrh, is a disease of very frequent occurrence in all the northern part of our country, as I have shown while speaking of the etiological relations of climate.

It usually commences with a sense of heat, dryness, and fullness, in the

* See Drake on the Principal Diseases of the Interior Valley of North America, p. 792.

nostrils ; a watery appearance of the eyes; frequent sneezing ; dull pain in the forehead and temples; sometimes rigors or chilliness ; followed by slight general fever, and acceleration of pulse. In from twelve to eighteen hours, the heat and dryness in the nostrils give place to the secretion of a thin water colored mucus that increases in quantity until at the end of twenty-four hours it will require the constant use of a handkerchief to keep it from dripping from the nostrils. The Schneiderian membrane is red and tumefied from the intense injection of the vessels, and this redness often extends from the posterior nares over a part of the pharynx and arch of the fauces, while the tumefaction of the membrane over the turbinated bones and in the middle part of the nasal passages so nearly closes them as to prevent getting the breath except by opening the mouth. This is particularly annoying to nursing children who can take but one or two swallows of milk from the breast before they are obliged to let go the nipple to take in breath through the mouth. In most cases in from twenty-four to forty-eight hours after the commencement of the attack, the heavy, dull, feeling in the forehead begins to abate, the secretion in the nostrils begins to be thicker and flows less freely; and in another day it becomes whitish, opaque, or muco-purulent. At the same time the tumefaction of the membrane begins to abate, and there is less trouble in breathing through the nostrils, except after sleeping when the accumulation of thick muco-purulent matter necessitates free blowing of the nose to clear it away before the breathing can go on well in the morning. In most of the acute cases the decline of the inflammation is sufficiently rapid to allow the patient to regain free use of the nostrils and exemption from further annoyance in from five to seven days. Such is the most common course of acute inflammation in the membrane lining the nasal passages, as it occurs in persons of all ages, from infancy to old age, but most frequently in childhood and youth. There are, however, some important deviations from this simple course. Occasionally a case is met with in which the inflammation extends to the membranes lining the antrums or the frontal sinuses or both, giving rise to more severe pain and heaviness both in the cheek bones and frontal region; more general febrile disturbance, with scanty and high colored urine. Such cases are more protracted, but pass through the same stages as those I have just described. When the discharge from the nostrils begins to be opaque or muco-purulent, there comes along with it, or sometimes a day or two later, a considerable quantity of a yellow, serous fluid, which makes the handkerchief stiff and sticky as if it had been wet with starch. This comes from one or more of the cavities just mentioned, and is usually followed by much relief, or entire recovery.

In other cases, however, the disease having reached the third or muco-purulent stage, further progress in the direction of resolution of the inflammation ceases, and the case assumes a chronic form, in which condition it is liable to remain for months and sometimes years. Another class of cases commences in all respects like those of simple acute nasal catarrh, and in three or four days the irritation declines rapidly, but coincidently attacks in succession the membrane lining the fauces, pharynx, trachea, and bronchial tubes, causing soreness and tightness in the chest, with severe cough, and sometimes much dyspnœa. There is, also, still another class of cases in which the inflammation attacks simultaneously the whole mucous membrane of the air passages, accompanied by rigors, and followed by general irritative fever of considerable severity. These are cases of influenza, and have been fully considered in the ninth lecture of the present course.*

*See page 69 of present Vol.

Chronic Inflammation of the Membrane lining the Nasal Passages.—Some degree of chronic inflammation in the mucous membrane lining the nostrils and pharynx, usually called chronic catarrh, is one of the most common diseases met with in all cold and variable climates.

It is most generally the result of repeated acute attacks, but sometimes originates as a chronic form of disease without having been preceded by acute symptoms. It may occur at any period of life, although attacks are much more frequent in childhood and youth than later in life. The cases as met with in ordinary practice may be arranged in four groups. The first group includes all those cases characterized by a simple morbid sensitiveness of the Schneiderian membrane, which, during warm dry weather gives the patient little or no trouble, but responds so readily to the influence of cold and damp air that the membrane becomes congested with the first recurrence of the wet and cold weather of autumn and remains so through the winter and spring. In most of these annually recurring cases, the patient simply suffers from a feeling of fullness or obstruction in the nostrils, coupled with an abundant secretion of mucus, mostly of a water color and readily dislodged by blowing the nostrils freely.

But any special or unusual exposure to currents of cold damp air generally causes a temporary increase of tumefaction in the membrane with greater stenosis or obstruction to breathing through the nose, stopping of the tear ducts and a watery appearance of the eyes, which lasts from two to four days; and on its subsidence the secretion presents more of a muco-purulent appearance for two or three days and then returns to the state previously described. When the patient lies on the back, more or less of the secretion falls into the pharnyx and may be either swallowed, or hawked out by voluntary effort. In this class of cases there is usually little or no deterioration of the general health of the patient, but much annoying inconvenience during the cold part of every year.

The second group embraces such cases as involve chiefly the membrane lining the posterior part of the nostrils and covering the pharynx, constituting a naso-pharyngeal disease of varying degrees of severity, but always annoying to the patient. The chief symptoms are a sense of fullness in the fauces with an excess of mucus, frequently of a thick viscid character, requiring much snuffing and hawking to dislodge it, especially in the morning, as it tends to accumulate in the posterior nasal fossa during sleep, and is capable of only an imperfect expulsion by blowing through the nostrils. In this class of cases there is little appearance of disease or discharge from the anterior part of the nostrils ; but the whole surface of the pharynx, the arch of the fauces, and the lining of the posterior nostrils as far as it can be seen, are red and tumefied from congestion of the vessels and more or less hyperplasia of the epithelium and connective tissue of the mucous membrane. In some cases the follicles are large, rounded, and smooth, looking like granulations. The discharge varies much in quantity and quality, being sometimes scanty and of a bluish tenacious character, and at others abundant and of a yellowish muco-purulent appearance. These cases, though often greatly aggravated by fresh exposures to the ordinary exciting causes in the changeable seasons of spring and autumn, seldom entirely disappear even in the warmest part of summer.

The cases included in the third group, are in some degree a modification of those just described. The seat of the disease is the same, occupying chiefly the posterior part of the nostrils and pharynx ; but the inflamed membrane is darker red, dry, in some cases smooth, in others granular, and looking as though denuded of its epithelium. The secretion is scanty and of a gluey tenacious quality ; and usually dries up into crusts, like scabs, of

various sizes from the circumference of a small pea to that of a nickel half-dime. The larger masses accumulate mostly on the floor of the posterior and middle part of the nostrils, but the smaller ones may be often seen adhering to the dry surface of the upper part of the pharynx. In many cases these dried masses or crusts are dislodged with much difficulty and often yield an unpleasant odor. This group of cases is less influenced by atmospheric conditions or changes of the seasons, than either of those I have just previously described; and are almost always associated with either a scrofulous or syphilitic constitutional condition.

The fourth group includes those cases which are described by most authors and teachers under the name of *ozena*. In these, the inflammation is located in the membrane covering the upper and lower turbinated bones, and lining the middle and anterior part of the nasal passages. It is met with mostly in childhood and youth, though sometimes also in the early part of adult life. It may be limited to one nostril or it may involve both at the same time. The most prominent and characteristic symptoms are redness and tumefaction of the membrane, especially where it covers the lower turbinated bone and lines the vomer, with an abundant muco-purulent discharge more or less offensive to the smell. In most of these cases the swelling of the membrane where it covers the lower turbinated bone presents a prominent rounded or projecting surface somewhat like the appearance of a polypoid growth, and either completely closes up or greatly narrows the passage through the nostril. In some children the discharge is not only abundant and muco-purulent but sanious or irritating, causing excoriation of the upper lip which in some instances becomes covered with a thick honey-comb like scab, adding much to the bad looks as well as discomfort of the child. In other cases the inflamed membrane in the nostrils becomes ulcerated, and even the turbinated bones more or less carious or necrosed. In some, the ulcerative process extends to the cartilage of the septum, destroying more or less of it and leaving a permanent opening from one nostril into the other. In most of the cases in this group, there is some degree of offensive odor to the discharge and to the breath that comes through the nostrils; and in such as are accompanied by caries or necrosis of the bones the odor is almost intolerable.

The cases belonging in this group, like those in the preceding one, occur almost exclusively in persons inheriting a syphilitic or scrofulous diathesis, or in those surrounded by such sanitary conditions as favor the development of the latter. In the naso-pharyngeal cases constituting the second and third groups, it often happens that the inflammation extends along the Eustachian tube to the middle ear causing sometimes pain, but more generally only a sense of fullness with hissing, buzzing or other noises in the ear, and more or less impairment of hearing. In a few instances the inflammatory process extends into the lining of the antrums or frontal sinuses. In the former it may reach the root of some tooth that has penetrated the floor of the antrum, and cause it to become necrosed and the antrum filled with a sero-purulent fluid, thereby adding to the other symptoms much sense of fullness and severe pain in the region of the upper maxillary bone.

A case of this kind came under my observation only a few months since, in which the extraction of the tooth was followed by the discharge of a large quantity of offensive purulent matter from the antrum. By rinsing out the antrum every day with anti-septic liquids, the suppurative process was arrested, the odor removed, and the patient recovered as far as the antrum was concerned; but he still suffers some from the chronic naso-pharyngeal inflammation.

Diagnosis.—I have given you all the important diagnostic symptoms in relating the clinical history of each group of cases, rendering it unnecessary to repeat them here. I wish to remind you, however, that the habitual use of tobacco, either by smoking or chewing, causes, in many persons, a congested and slightly swollen condition of the naso-pharyngeal membrane, sufficient to cause an unpleasant sense of fullness and a disposition to hawk and clear the throat with annoying frequency. If you regard these as cases of ordinary mild naso-pharyngeal inflammation, and attempt to treat them without prohibiting the further use of the tobacco, your treatment will be found to exert very little curative influence.

Prognosis. — It is probable that uncomplicated cases of inflammation of the nostrils and pharynx of a chronic character have never destroyed life.

The prognosis, therefore, so far as relates to a continuance of life, is favorable in all grades of the disease. But though the disease does not directly endanger the loss of life, it is always troublesome to the patient; in some of its forms sufficiently severe to impair the general health; and very difficult of permanent cure, more especially while the patient remains in a cold and variable climate.

Treatment. — There are very few of the more common diseases met with in the ordinary routine of medical practice, that have been treated more empirically, or have prompted the invention of a larger number of specific cures, than the various grades of inflammation of the mucous membrane of the nostrils and pharynx. Catarrh snuffs, nasal douches, sprays, and inhalations, have been invented and used with but little discrimination in all varieties and stages of the disease. Many of them have been useless, and some productive of positive harm instead of benefit.

This is especially true of the too free and indiscriminate use of the nasal douche, by which inflammations and injuries have been caused in the middle ear, of more importance than the original catarrhal affection of the nostrils. I need hardly remind you, gentlemen, that there are no real specifics for the cure of any stage of inflammation of the mucous membranes, in the nostrils or elsewhere. And if you would give your patients suffering from any form of the annoying maladies now under consideration, the greatest possible degree of relief, you must in each case give due attention to the causes that may have induced the disease and may be still active in perpetuating it; to the extent and stage of advancement of the disease itself; and to the coincident constitutional condition of the patient. There are very many cases of the acute and subacute forms of inflammation in the Schneiderian membrane, called coryza, which arise from temporary exposures to severe atmospheric changes by persons in other respects in good health, that get well in a few days without coming under the care of the physician.

There are many other cases of the same class for which the physician is consulted, that need no other treatment than the restriction of the patient to a light plain diet with a limited use of liquids of any kind, and the taking of some laxative and diuretic medicine sufficient to gently increase the action of the bowels and kidneys. For this purpose a saturated solution of the bi-tartrate of potassium in sweetened water, may be given in doses of ten or fifteen cubic centimeters (fl. ʒiiss or ʒiv) three or four times during the day. Or if you are called early to a case of more than ordinary severity, just as the first stage of intense congestion of the membrane is beginning to give place to the copious thin discharge that usually follows, you may give the patient a full dose of the compound powder of opium and ipecacuanha, cover him up in bed for a sleep of six or eight hours, after which the bowels may be opened by a saline laxative, and if he takes

only light food and a limited amount of liquids, it will in a large proportion of cases cut short the attack with but little nasal discharge. If any local applications are used in the first and second stages of such cases they should be simply of a soothing or anodyne quality, and in the form of vapor. It is doubtful, however, whether in ordinary cases they do enough good to compensate for the trouble of using them. You may be sometimes called to cases in which the stage of congestion and that of thin mucous secretion have both passed by, and you find the patient with a copious muco-purulent discharge, and considerable tumefaction of the nasal membrane; some dull frontal pains; slight acceleration of pulse and increase of temperature in the afternoon and evening, followed by some sweating in the latter part of the night; and a general feeling of weakness, with impairment of appetite. Such cases if neglected, are liable to be protracted in duration or end in the development of a chronic form of the disease.

This result can be prevented in most cases, and the patient relieved in a few days, if you will give him from two to three decigrams (gr. iii to v) of sulphate of quinia each morning, noon, and evening; see that the bowels are simply kept regular by mild means; the diet plain but sufficiently nourishing; and the nostrils carefully washed out each morning and evening with some mild antiseptic and slightly astringent wash. I have used none that had a better effect than the solution of carbolic acid and sulphate of zinc, each six centigram (gr. i) to thirty cubic centimeters (fl. ℥i) of water. The solution may be used with a suitable syringe, or if the patient can exercise good judgment, he may be instructed to snuff or draw it up gently from the palm of his hand, until he feels it pass into his pharynx from which he can readily hawk it forward, and spit it out.

In the treatment of *chronic* naso-pharyngeal inflammations, the benefit you confer upon your patients will depend very much upon the amount of attention you give to the removal of such co-existing functional and constitutional derangements as often exert much influence in perpetuating the local catarrhal affection, and on the skill with which you adjust the remedies addressed directly to the latter, to the particular grade of inflammation in each case. A large proportion of all the varieties of chronic cases have for their predisposing cause habitual failure or inefficiency of one or more of the excretory functions by which the products of tissue change and other disturbing elements, are separated from the blood and eliminated from the system. This failure may be in the lungs and skin through want of regular active out door exercise, or in the bowels from habitual constipation; or in the failure of the kidneys to promptly increase the activity of their secretory action whenever the cutaneous surface is restricted by exposure to cold and dampness. If by any of these modes more or less of the products of tissue disintegration and waste are retained in the blood, they will not only greatly increase the tendency to develop disease in any of the more sensitive structures of the body, but their continuance through inattention of the physician, or neglect on the part of the patient, will render a cure of the local affection more difficult, and relapses more certain and persistent.

Long and careful attention to this subject has satisfied me that a very large proportion of chronic catarrhal affections of the respiratory organs have their origin in the failure of some one or more of the excretory functions to which I have alluded; and especially in failure to maintain the proper sympathy or compensative adjustment of action between the skin and kidneys during the transition of the seasons, as well as during the

more sudden transition from protracted periods of severe cold to a higher temperature.

A very important part of the treatment of all chronic cases therefore consists in carefully correcting whatever functional derangements exist. The judicious use of baths at such temperature as is most agreeable to the patient, perhaps twice per week, followed by thorough frictions with dry soft flannel; the wearing of warm flannel underclothes; and daily active out-door exercise, constitute the most efficient means for establishing and maintaining the natural eliminations from the skin and lungs. Constipation may be obviated and digestion improved by the use of certain tonics combined with just enough laxative medicine to secure a regular intestinal evacuation once in the twenty-four hours. For this purpose I have found nothing better suited to most cases, than the following combination:

℞				
	Ferri Sulphatis	2.0 grams	gr.	xxx
	Extracti Hyoscyami	2.0 "	"	"
	Pulveris Aloes	0.6 "	"	x
	Pilulæ Hydrargyri	0.6 "	"	"
	Extracti Nucis Vomicæ	0.6 "	"	"

Mix. Divide into pills xxx; of which one may be taken before each meal-time, or before breakfast and dinner, as is found necessary to secure an easy, natural passage from the bowels once a day. If the case you have in hand is complicated with constitutional syphilis or scrofula, you must call to the aid of your patient all those hygienic and remedial measures that I recommended in lectures twenty-eight and thirty of the present course.*

Local Treatment.—Remedies addressed directly to the diseased membrane, to be beneficial, must be carefully adjusted, both in their nature and modes of application, to the special conditions of each case. In the cases belonging to the first and second groups, as I have described them, the solution of carbolic acid and sulphate of zinc, used in the same manner as I mentioned when speaking of the treatment of the more advanced stage of acute cases, will be found one of the best that can be devised. In many of the same groups of cases, the frequent inhalation of the vapor of the oil of eucalyptus, has proved beneficial. This may be taken directly from the open mouth of a small vial containing eight or ten cubic centimeters (℥ii or ℥iiss) of the oil. In cases of long standing, in which there is much thickening of the membrane and hypertrophy of the follicles, remedies capable of producing a degree of stimulating and alterative effect may constitute the best local applications. One that I have used in such cases with good effect is a solution of iodine three decigrams (gr. v) in fifteen cubic centimeters (fl. ℥iv) of chloroform in a little vial with a glass stopper. One or two slow, full breaths of the vapor from the open mouth of the vial may be drawn through each nostril five or six times a day. The vial should be kept well stopped except while in actual use. In the cases I described as belonging to the third and fourth groups, one of the most important objects to be accomplished by local remedies is to maintain cleanliness and proper disinfection of the nasal passages. For this purpose the nostrils should be carefully but efficiently washed out, once or twice a day, with a solution of carbolic acid and sulphate of zinc in the proportion of six to thirteen centigrams (gr i to ii) of each, in thirty cubic centimeters (℥i) of water. Solutions of permanganate of po-

* See pages 258 and 286 of this Vol.

tassium, benzoic acid, and chloride of sodium may be used for the same purpose and of the same strength. The best and safest instrument for using these solutions to cleanse the diseased surfaces is the post-nasal syringe. And even the use of this should not be intrusted to entirely unskillful hands. Their use with the ordinary fountain nasal douche is so liable to be followed by pains and inflammation in the Eustachian tubes, middle ear, and antrums, that I have deemed it better to prohibit this method altogether. In several cases I have found free cleansing of the nasal passages with the syringe once in three days, and the use, each morning and evening during the intervening days, of inhalations of a mixture of ca bolic acid two grams (gr. xxx) oil of Scotch pine four cubic centimeters, (fl. ʒi) and camphorated tincture of opium sixty cubic centimeters (fl. ʒii) in the following manner to keep the parts in good order: Put four cubic centimeters of the mixture into half a pint of hot water in an ordinary inhaling bottle, and instruct the patient to take in a full inspiration of the vapor from the mouth-piece and force it back through the nostrils. This process may be continued from three to five minutes two or three times a day. If proper attention is given to such internal treatment as the general health and special constitutional condition of the patients require, on the principles I have indicated, with the aid of the local applications I have now mentioned, almost all the cases of chronic nasal and naso-pharyngeal inflammations will be greatly improved and many of them will be cured. But those cases which have become complicated with extensive ulceration of the membrane and either caries or necrosis of the turbinated or other bony or cartilaginous structures, will make no marked progress toward recovery until the diseased portions of bone are removed either spontaneously, by exfoliation, or by surgical interference. When foul and ill-conditioned ulcerated places are so located that they can be reached with the aid of the rhinoscope and other instruments, much improvement may be produced by applying to the ulcerated surface daily a small quantity of a powder composed of finely pulverized white sugar two parts and iodoform one part. Having given you the results of my own observations and clinical experience in the management of the various grades of the disease under consideration, I will detain you for only one further remark, namely, that a very large proportion of patients suffering from chronic naso-pharyngeal inflammation can be *permanently* relieved only by changing their residence from a cold, variable climate, to one mild and dry; and at the same time abstaining altogether from the use of alcoholic drinks and tobacco.

LECTURE XL.

Inflammations of the Larynx and Trachea—Croup: Their Varieties, Causes, Anatomical Characteristics, Symptoms, Diagnosis, Prognosis and Treatment.

GENTLEMEN: Although the larynx and trachea are anatomically distinct divisions of the respiratory passage, and the mucous membrane in each capable of being inflamed to some extent without extending into the other, yet in all the more serious attacks the membrane in both sections is involved, constituting a true laryngo-tracheitis. Practically, there-

fore, they constitute but one section in their relations to the inflammatory affections, and I shall so regard them during the remainder of the present lecture.

Varieties.—Laryngitis, or laryngo-tracheitis, may be met with in all degrees of intensity, from simple hyperæmia, with increased irritability of the texture, to the most intense plastic or pseudo-membranous inflammation. It may be acute, running its course in a few days, or it may be so chronic as to continue as many months, or even years. Anatomically, the inflammatory process may be limited to the epithelial or free surface of the membrane, causing hyperæmia, with increased mucous exudation; or it may extend to the sub-mucous tissue, causing inflammatory exudations beneath the lining membrane as well as upon its surface and consequently greater tumefaction of the parts; or it may be of such grade as to cause the exudations upon the surface to be highly plastic, and to undergo rapid organization into a layer of false membrane closely adherent to the inflamed surface. On the other hand, cases more rarely occur involving the sub-mucous tissue, and causing a serous exudation by which the parts are rendered œdematous and much tumefied. Hence, for convenience of description, the cases liable to be seen in general practice may be arranged into four groups, namely, the mucous or superficial laryngitis; the sub-mucous; the pseudo-membranous; and the œdematous. Either of these varieties may be acute, subacute or chronic, in their grade and rate of progress.

Causes.—The causes of the different varieties of laryngitis are the same as I mentioned, more in detail, when discussing the etiology of inflammations of the mucous membrane of the respiratory passages generally, in the preceding lecture. The first or superficial variety is of frequent occurrence at all periods of life; and may be produced by exposures to cold and damp air especially when accompanied by high winds; by excessive use of the voice; and as a result of eruptive fevers and tuberculosis. The second and third varieties occur much more frequently in childhood; while the fourth, or œdematous laryngitis is mostly limited to the adult period of life.

Pathological Anatomy.—The anatomical changes which take place during the progress of inflammation in the membrane lining the larynx and trachea do not differ essentially from those which characterize the same grade of inflammatory action in other parts of the respiratory mucous membrane. In the simple superficial inflammation there is intense redness from congestion of blood in the vessels and slight tumefaction, with temporary dryness, followed speedily, however, by an increased secretion of mucus, at first transparent and tenacious, but subsequently changing to a white, opaque, or slightly yellowish appearance, and containing more or less epithelium and pus corpuscles. If the inflammation is more severe, extending to the sub-mucous tissue, there is added to these superficial changes, more or less exudation of serum with white and red blood corpuscles, into the texture of the membrane and into the connective tissue beneath it, adding much to the tumefaction of the parts. In the middle and later stages of the case pus cells become freely mingled with the other exudative materials, and in some instances the basement membrane becomes denuded of its epithelium in patches, giving it the appearance of abrasions or slight ulcerations. In the third, or pseudo-membranous grade of the inflammation you find all the changes I have mentioned as belonging to the simple mucous and sub-mucous varieties, with the important addition of a large proportion of fibrin and lymphoid cells in the exudative materials.

The addition of these plastic elements causes the exudative materials

upon the surface of the membrane to rapidly solidify or organize into a firm, white, adherent layer of false membrane; generally thickest and most adherent over the vocal cords and the rima glottis, but often extending upward over the lower part of the pharynx and downward through the whole extent of the larynx and trachea to the larger bronchi. The rapid exudation upon the surface of the membrane in this class of cases detaches much of the epithelium. and hence on close examination you find in many places the layer of false membrane resting directly on the surface of the basement membrane, but not permeating it, as is the case in the membranous formations of true diphtheria. More or less of epithelial and pus cells, and red blood corpuscles may be seen in the meshes of the fibrillated fibrin constituting the basis of the false membrane. As the disease advances beyond the first stage, the proportion of pus cells and necrosed epithelium cells increase, with an increased exudation of mucus, lessening the tenacity of the plastic or organized false membrane and causing it to be detached in shreds or patches, and sometimes in whole tubes of considerable length. At first, new layers of false membrane form on those surfaces from which the first layer had been detached, but in acute cases this tendency ceases after the fourth or fifth day, and the inflammatory process rapidly declines. In the fourth group of cases, called œdematous laryngitis, a large part of the exudation is into and beneath the membrane, and is composed of serum or the watery element of the blood. Consequently it is a true œdema of the parts, especially over the vocal cords and at the base of the epiglottis. Occasionally colonies of bacteria have been found in the meshes of the pseudo-membranous formation, but with no uniformity, and no evidence that they exert any causative influence.

Symptoms.—The circumstances connected with the natural structure of the larynx, exert much influence over the character of the symptoms which accompany inflammation of its lining membrane, as well as over the results of such inflammation. These are, the narrowness of the rima glottidis, or opening into the larynx; the firm, unyielding condition of its walls; and the special sensitiveness of the nerves of the part. The narrowness of the entrance from above into the larynx is such, that a very moderate swelling of the lining membrane is capable of creating marked dyspnœa or obstruction to the breathing, while the firmness of the laryngeal walls prevents distension, and thereby causes the whole of the congestion and tumefaction to crowd inward, still further diminishing the space for the ingress and egress of air in breathing. The sensitiveness of the nerves and their relation to the muscles of the larynx, and, in some degree, to the muscles of respiration generally, cause the presence of inflammatory action to readily excite severe spasmodic contractions in the muscles and to impart to the cough a spasmodic and paroxysmal quality, both distressing and, in some cases, dangerous to the patient. The milder cases of superficial inflammation of the larynx in the adult are characterized at first by a sense of fullness, soreness and heat in the larynx; hoarseness or roughness of voice; a dry and rough or ringing cough; and slight sense of difficulty in breathing.

The general febrile symptoms in such cases are very slight, and in some, absent altogether. In the same class of cases in children under five years of age, there is more uniformly sufficient fever to cause a little acceleration of pulse, a rise of one or two degrees of temperature, and the addition of more distinct paroxysms of dyspnœa from constriction of the larynx, with a more spasmodic quality of cough. After the first twenty-four hours, the increased secretion or exudation of mucus upon the surface of the inflamed membrane renders the cough less dry and ringing, and causes some

coarse moist rales as the air passes through the larynx. In most cases during the third day, whatever of general febrile symptoms had existed, disappear; the cough is less spasmodic and accompanied by more free mucous expectoration; and the paroxysms of dyspnœa less frequent. During the next two or three days the hoarseness and all other symptoms of disease disappear; making the whole duration of the laryngeal symptoms from five to seven days. In the second or sub-mucous grade of inflammation, the symptoms are the same in kind but much more severe. There is usually some chilliness at the beginning, followed by more decided fever; more frequency and fullness of pulse; more sense of constriction in the larynx; more frequent and severe paroxysms of dyspnœa with dry whistling sounds in the larynx at first, subsequently replaced by coarse mucous rattles; a more severe spasmodic or suffocating cough with increased hoarseness and, in some cases, entire suppression of voice. In the more severe examples of this class during the second and third days, the opening of the larynx becomes so narrowed by the exudation into and beneath the membrane, and the constant accumulation of mucus upon its surface, that the difficulty of breathing is constant and noisy, with paroxysms of coughing that seem to threaten the actual suffocation of the patient. The mucus is tenacious and difficult to dislodge, especially in young children, and yet accumulates so rapidly as to compel frequent and tiresome efforts at coughing, during some of which the stomach turns and brings an effort to vomit, by which considerable quantities of mucus are expelled from the larynx and throat, with much temporary relief to the little sufferer. But the constant obstruction to the ingress and egress of air, coupled with the frequent struggles in the paroxysms of coughing, soon begin seriously to impair the oxygenation and decarbonization of the blood and to exhaust the strength of the patient. The flush of the face gives place to a bloated and pale appearance with a leaden or purplish hue of the prolabia; the extremities become cool and bluish; pulse, frequent and small; the mind dull, with inclination to lie with the head thrown a little back to straighten the larynx; the eyelids only partly closed, and the larynx moving up and down with every inspiration and expiration, accompanied by laryngo-tracheal rales loud enough to be heard over the whole room. This, to the patient, half unconscious quiet, is disturbed every five to fifteen minutes by sudden and severe paroxysms of coughing, and struggling to clear away the laryngeal obstruction.

In the worst cases of this class, at this stage of their progress, the strength of the patient fails rapidly; the extremities become cold; pulse a mere thread; discharges of urine and fæces involuntary; the face more pale, eyeballs turned upward, with the lids half-closed; the mind too dull to be aroused; the head further back; the larynx still more strongly moved up and down with the efforts to force air through it; until, at length, the chin drops and, with a few more gasps for breath, the struggle for life ceases. Such, gentlemen, is an outline of the phenomena accompanying the progress of a fatal case of sub-mucous laryngitis, or croup; and you will only need to witness it once to have its vivid and distressing features indelibly fixed in your minds. When death occurs in this class of cases, it is usually between the third and fifth days from the beginning of the attack. But in most of this class of cases, the tumefaction of the membrane and the accumulated inflamatory products are not sufficient to fatally interfere with the respiratory function, and after the second day, the sub-mucons exudation begins to diminish, the mucus on the surface becomes more abundant, less tenacious and a little opaque; the paroxysms of coughing are less suffocating and dislodge the mucus more readily, and the general febrile symptoms also begin to abate. The crisis of the inflammatory process

having passed, the symptoms continue to improve from day to day, and leave the patient convalescent in from five to nine days from the commencement of the symptoms.

In the pseudo-membranous class of cases, called by some writers *true croup*, the essential symptoms and progress correspond closely with those of the most severe cases belonging to the sub mucous class as just described. The attacks are limited mostly to children under ten years of age. They differ from the severe cases just fully described chiefly in three particulars. (*a*) The stage during which the laryngeal sounds remain dry and whistling, is more marked and protracted, with apparently greater constriction of the tube. (*b*) The voice is more hoarse or more completely suppressed, and the paroxysms of coughing are characterized at first by greater spasmodic violence and loud stridulous sounds, and subsequently by a muffling or suppression of the sounds, corresponding with the suppression of the voice. (*c*) There appears early upon the surface of the rima glottidis, epiglottis, and sometimes up over the lower part of the pharynx a layer of white, fibrinous and plastic exudation which constitutes the pseudo-membrane, that has given the name of pseudo-membranous laryngitis or membranous croup to this variety of the disease. At the same time the secretion of mucus is much more scanty than in the other varieties, and when the patient begins to dislodge and expectorate some in his paroxysms of coughing, close examination will generally discover in it small shreds of the solidified or fibrillated fibrin torn from the layer of adherent pseudo-membrane. If the patient does not suffer so rapid an accumulation of the inflammatory products as to induce death by suffocation within thirty-six hours, the mucous secretion increases, adding more of the rattling moist sounds to the breathing, and in the severer paroxysms of coughing dislodging larger pieces of the false membrane. From this stage of progress, in the milder examples of this class, the mucous secretion continues to increase and becomes more opaque; the false membrane gradually loosens and is dislodged more and more freely in shreds and patches by the violent paroxysms of coughing, aided sometimes by vomiting; and in some rare instances, the whole membrane is expelled at once, presenting when distended in water a complete representation of the interior of the larynx. With the breaking up and expulsion of the false membrane, all the essential symptoms improve and the patient reaches the stage of convalescence in from one to two weeks. In a large proportion of this class of cases, however, the plastic exudations continue to accumulate, the laryngeal obstruction becomes hourly more severe until some time between the second and fifth days death ensues, preceded and accompanied by essentially the same symptoms I have already described.

The fourth group of cases which includes those affected with true œdema of the glottis, occurs almost exclusively in adults, in connection with a debilitated, depraved or anæmic condition of the system caused by some prior disease. It has occurred during the convalescing stage of typhoid and typhus fevers. Only a few months since a fatal case of this kind occurred in the Mercy Hospital, in an adult male, who had begun to convalesce from a severe attack of typhoid fever complicated with severe broncho-pneumonia. The attacks generally supervene suddenly and the serous exudation or infiltration accumulates rapidly in the areolar or connective tissue at the base of the epiglottis and above the vocal cords, quickly suppressing the voice and causing such a degree of tumefaction as to obstruct the free ingress but not the egress of air, and giving rise to laryngeal dyspnœa, suffocating paroxysms of coughing, imperfect oxygenation and decarbonization of the

blood, and in most cases death from apnœa, or exclusion of air from the lungs, in from twelve to thirty-six hours. A few of the less severe cases recover.

Chronic Laryngo-Tracheitis.—Chronic inflammation may exist in any part of the lining membrane of the larynx and trachea, and may be either the sequel of an acute attack or may have originated *de novo*. A very large proportion of the cases met with in practice are the result of tubercular deposits in the follicles of the laryngeal membrane, and are uniformly associated with more or less tubercular disease in the lungs. I have met with no exceptions to this rule. Another, though less numerous class of cases, are the result of constitutional syphilis. Chronic laryngitis not dependent on either tuberculosis or syphilis is rarely met with in ordinary practice.

Symptoms.—The two most prominent and characteristic symptoms are alterations of the voice and cough. The first may be simply hoarse, rough or squeaking, presenting different degrees of dysphonia, or it may be suppressed, aphonia. The latter, which is always present in some degree but varying much in frequency and severity, presents the same characteristics as the voice, being in some cases simply harsh or rough, in others ringing or stridulous, and in still other cases so muffled as to be without vibratory sounds. In cases not complicated by either tuberculosis or syphilis, there is usually only a moderate sense of uneasiness or slight soreness in the larynx, but rather a tickling or sense of something present that ought to be cleared away, prompting the patient to cough or hawk, as if to clear the throat; yet in such cases, there is only a scanty secretion of mucus, which presents a white and rather frothy appearance when expectorated. On the other hand, when the case is complicated with tubercular deposits, the cough generally becomes much more troublesome and severe, harassing the patient much, especially during the last part of the night and early in the morning, accompanied in the early stage by the expectoration of a viscid water-colored mucus, which gradually becomes opaque, and finally purulent.

There is in these cases also much greater sense of soreness and constriction, with frequent pains in the larynx and trachea; and in the later stages of their progress, some general fever every afternoon and evening, disappearing with some sweating in the last part of the night, leaving the patient cool, pale, and weak in the morning, when the paroxysms of coughing are most severe and strangulating, and often accompanied by efforts to vomit. There is also a pretty constant loss of flesh and strength until the patient presents all the symptoms of the advanced stage of pulmonary phthisis, including copious purulent expectoration, hectic fever, night sweats and the physical signs of suppurative cavities in the upper part of one or both lungs. And yet, owing to the constant annoying sensations, such as tickling, soreness and sense of constriction in the larynx, which appear to be the immediate cause of the cough, the patient will persist in attributing all his sickness to the affection of the larynx, and often firmly deny that there is anything the matter with his lungs or parts within the chest. And I have met with some cases in which the attending physician had allowed himself to be so far misled by the positive assertions of the patient as to overlook the coincident pulmonary lesions entirely, until within a few weeks of the fatal termination. Let me caution you, gentlemen, against the committal of any such blunders. In every case of chronic laryngitis it will be your duty to examine the chest carefully and repeatedly for the physical signs of pulmonary tuberculosis, without regard to the sensations or opinions of the patient. When chronic laryngitis arises from syphilitic influence, the local symptoms differ from those of the tuberculous variety,

chiefly in the greater degree of pain and soreness, more distinct tenderness to pressure and sometimes slight swelling over some of the cartilages, and more rapid ulceration particularly of the epiglottis and parts above the vocal cords. When the epiglottis and lower posterior part of the rima glottidis is the seat of ulceration, whether connected with syphilis or tuberculosis, the swallowing of food becomes acutely painful; and when the epiglottis is largely destroyed, as happens in some cases, the taking of food is not only painful, but it so frequently enters the larynx, causing the most violent coughing and choking, that the patient can not be persuaded to take sufficient to prevent ultimate starvation.

Pathological Anatomy.—In simple uncomplicated chronic inflammation of the larynx and trachea, instead of intense redness as in the acute grade of the disease, the mucous membrane has a grayish color, and more or less of a granular appearance from hypertrophy of the mucous follicles, and is partially covered with a layer of mucus or muco-purulent matter. The epithelium covering the vocal cords is generally thickened and more opaque; and in most of the cases the whole inflamed part of the membrane is thicker and harder than natural from hyperplasia or increased growth of the connective tissue elements. Ulcerations are rarely seen in this class of cases; but in a few instances some of the mucous glands have become so much enlarged as to project like papillomatous growths from the surface of the membrane. A few cases have been reported in which the laryngeal membrane was atrophied or thinner than natural. In cases arising from primary tubercular deposits, ulcerations constitute a prominent part of the pathological changes, in addition to those I have mentioned. They are more frequently located at or near the posterior commissure of the vocal cords, but may be seen in different cases in all parts of the membrane.

You may find in one case but a single ulcer, and in another several, varying much in their size and progress. In the syphilitic cases, ulceration commences early and in most cases extends from the pharynx to the epiglottis first, and then downward into the glottis and over the vocal cords. In some rare instances the inflammation and suppuration extend to one or more of the cartilages, forming abscesses that may break, either into the larynx adding to the necessity for frequent coughing, and expectoration of pus generally more or less offensive to the smell; or externally through the integuments, where it will result in a protracted fistulous discharge, or extend into an open indolent ulcer; and in some instances involving necrosis of the cartilage itself.

Diagnosis.—The diagnosis of all grades of inflammation affecting the mucous membrane of the larynx, is not difficult. The interference with the function of the vocal cords and the access of air to the lungs, necessitates such changes in the voice, the cough, the mucous secretion, and the passage of air, as point directly to the seat of disease. And it only requires a reasonable degree of attention on the part of the practitioner to distinguish between the persistent and progressive symptoms of inflammation, and the more transient and changeable phenomena of mere nervous and functional disturbances. And in cases involving any doubts a careful examination with the laryngoscope should dispel them.

Prognosis.—On account of the narrowness of the opening into the larynx and the small amount of swelling in the parts required to close or so obstruct it as to deprive the lungs of sufficient air for the purposes of life, all of the more severe grades of inflammation affecting its interior membrane are highly dangerous and result in a large ratio of mortality. The simple mucous or superficial grade of laryngitis seldom terminates fatally, either

in childhood or adult life. The sub-mucous variety is necessarily accompanied by greater tumefaction, and consequently more danger, especially in young children ; yet a large majority of this class recover.

But the pseudo-membranous cases, which occur chiefly in childhood, result in a much higher ratio of mortality; and the same is true of the œdematous form of the disease as it occurs in adults. It is probable that considerably more than one half of all the cases of either of these varieties terminate fatally. The simple non-specific form of chronic laryngitis seldom causes sufficient swelling of the inflamed structures to obstruct the ingress or egress of air in such degree as to endanger the life of the patient; although it may give him great annoyance for an indefinite number of years. Chronic cases, dependent on constitutional syphilis, are generally curable by appropriate treatment, unless the cartilages have become necrosed with extensive suppuration; or so large a part of the epiglottis, rima glottidis, and vocal cords have been destroyed by ulceration as to prevent the patient from taking sufficient food. The scrofulous and tuberculous cases of chronic laryngitis very seldom recover, but the ultimately fatal termination is induced more by the progress of the disease in the lungs, than in that affecting the larynx or trachea.

Treatment.—The treatment of all forms of acute and sub-acute laryngitis embrace the accomplishment of three objects, namely, to lessen the morbid sensitiveness or irritability of the inflamed structures; to lessen the vascular fullness or congestion in the early stages and thereby limit the amount of either sub-mucous or plastic exudation; and in the later stage to hasten the disintegration and removal of such exudation as may have occurred.

In the mild or superficial form of the disease, neither of the pathological conditions on which these indications are founded, are sufficiently developed to endanger the life of the patient or to require very active remedial measures for relief. Confinement to the house, or protection from further exposures to cold or severe currents of air, the inhalation of some mild anodyne vapor, or the taking of a mild anodyne expectorant, is usually sufficient to cause the disappearance of the symptoms in a few days. The following is a prescription I have long used in this class of cases with benefit:

℞			
	Syrupi Scillæ Compositi	45.0 c. c.	℥iss
	Syrupi Ipecacuanhæ	15.0 "	℥ss
	Tincturæ Opii Camphoratæ	60.0 "	℥ii

Mix. To an adult, I give four cubic centimeters (fl. ʒi) in a little water every three, four, or six hours. To children less in proportion to their age. If the skin is quite hot and dry and the urine scanty I give from six to twenty centigrams (gr. i to iii) of calomel, and follow it with a saline laxative sufficient to procure two or three intestinal evacuations.

These measures, with a continuance of moderate doses of the anodyne expectorant mixture for three or four days, usually constitute all the treatment needed in such cases. In the second group of cases, in which the inflammation involves the membrane more deeply, and if not checked in its incipiency, causes the accumulation of exudative material both in the texture of the membrane and in the sub-mucous areolar structure, the tumefaction or swelling is sufficient to cause more or less danger from its obstruction to the ingress and egress of air. Consequently this class of cases need prompt and efficient treatment. As this form of the disease is met with most frequently in children, if I am called early to a child between three and five years of age, presenting the symptoms I have men-

tioned as characterizing well marked cases of sub-mucous laryngitis, I order a powder containing fifteen to twenty centigrams (gr. iiss to iii) of the sub-sulphate of mercury (turpeth mineral) to be given at once, which seldom fails to produce free vomiting in from fifteen to forty-five minutes. If it fails to do this I have the dose repeated at the end of forty-five minutes. Directly after the vomiting I commence giving the same anodyne expectorant mixture, the formula for which I gave you only a few minutes since, in doses of from one to two cubic centimeters (min. xv to xxx) every two or three hours. If the bowels are not already loose, I give, also, thirteen centigrams each of calomel and bicarbonate of sodium, in one dose, which usually induces a moderately free evacuation from the bowels in three or four hours.

These measures are usually followed by much relief to the breathing; more free secretion from the mucous membrane of the air passage; and less fever. If such relief continues for twenty-four or thirty-six hours, the crisis of the disease will have passed, and the case will require only the moderate continuance of the anodyne expectorant mixture for two or three days or until convalescence is fully established. But in many cases the relief following the first vomiting proves only temporary, and in from three to six hours the paroxysms of dyspnœa and coughing again become severe. When this is the case I promptly repeat the *emetic* dose of the sub-sulphate of mercury, after the action of which the same internal remedies are continued as before, while externally I keep the front part of the neck covered with cloths wet in an infusion of hops or aconite leaves holding in solution muriate of ammonia. In the more sanguine and robust class of children, I have applied leeches in sufficient number to cause a pretty free local bleeding, in the early stage of the disease, with the most decided benefit. You may occasionally meet with a case in which after the acute stage has passed by, there remains a harsh croupy cough, with sufficient tightness in the larynx to indicate that the tumefaction of the mucous membrane is subsiding very slowly. If you do, the substitution of the same quantity of the tincture of sanguinaria in place of the syrup of ipecacuanha in the formula I have given you, and the addition to the same of ten grams (℥iiss) of the iodide of potassium, will add much to its alterative properties and render it more efficient in promoting the removal of the remaining inflammatory products. In locations where malarious or periodical fevers prevail, sulphate of quinia, in doses of thirteen centigrams (gr. ii) may be given between the doses of the expectorant mixture, to a child five years of age, with much benefit.

In the pseudo-membranous variety of laryngitis, the treatment must be guided by the same principles as in the sub-mucous variety, but pursued more energetically, especially in the early stage. A prompt local bleeding by leeches, and free vomiting by the sub-sulphate of mercury should commence the treatment, and be followed by a cathartic dose of calomel and bicarbonate of sodium. Then the anodyne expectorant mixture already mentioned should be given alternately with alterative doses of the calomel and nitrate of potassium, from one to two hours apart. The emetic should be repeated in from three to six hours according to the degree of dyspnœa and whistling sounds in the larynx. If possible, the spray of dilute lactic acid, one cubic centimeter (min. xv) to forty-five cubic centimeters (fl. ℥iss) of water, should be thrown into the pharynx freely every hour. If, under the combined influence of these remedies, the progress of the disease appears checked, as indicated by less dyspnœa, more free expectoration of opaque mucous with numerous shreds of the pseudo-membrane, less spasmodic violence in the paroxysms of coughing, and less general fever,

the further use of emetics may be dispensed with, and the other remedies given at longer intervals. If the improvement continues after the first thirty-six or forty-eight hours, the calomel and nitrate of potassium may be discontinued, and moderate doses of sulphate of quinia given in their place. If instead of improvement, however, you find your patient on the second or third day showing signs of exhaustion, such as paleness of the face with a leaden hue of the prolabia; cool extremities, feeble pulse, more constant difficulty of breathing, and drowsiness between the paroxysms of coughing, you had better omit both the anodyne expectorant mixture and the powders of nitrate of potassium and calomel, and give instead, a solution of lactate of iron in water alternately with moderate doses of the sulphate of quinia.

To a child five years of age you can give from three to six centigrams (gr. ss to i) of the lactate of iron in solution every two or three hours, and from six to nine centigrams (gr. i to iss) of quinine between. Once or twice in the twenty-four hours, if the larynx becomes very much obstructed by the exudation, a quick free vomiting may be induced by giving a full dose of powdered alum and ipecac, with the hope that much of the accumulation has become loosened and may be expelled during the effort of vomiting. It is true that most of the patients who reach the condition I have described will die. But none should be given up or abandoned until life has actually ceased, for I have seen several recover from a condition apparently hopeless. In the first stage of these severe cases but little attention need be paid to nourishment; but in the more advanced stage when the strength begins to fail, milk, beef tea, etc., should be given as regularly as the doses of medicine. In cases where the relief is partial, and there appears to be a tendency to run a protracted course, one or more small blisters in the vicinity of the larynx may do good. Throughout the whole course of the disease the temperature of the air in the room should be kept uniform as possible varying from 20° to 21° C. (68° to 70° F.), and rather moist. Some direct the air of the room to be kept at a much higher temperature and constantly saturated with aqueous vapor. But my own observations have led me to think such an atmosphere strongly calculated to lessen the exhalations from the lungs, and to increase the danger of early and excessive prostration. A large number of other remedies, besides those I have mentioned, have been strongly recommended by different writers, most of which I have either tried or had ample opportunities of seeing tried by others. In the list of emetics you may find lobelia inflata, tartar emetic, alum, sulphate of zinc, sulphate of copper, ipecacuanha, and apomorphia; while as local remedies you will find the inhalation of the vapor of water containing freshly slacked lime, the spray of chlorate of potassium, iodide of potassium, nitrate potassium and benzoate of sodium, with and without the addition of belladonna or conium to the solution; and the direct application of strong solutions of nitrate of silver, iodine, and tincture of chloride of iron. But from none of them have I seen as good results as from the course I have directly recommended to you. As the great points to be gained in the management of the pseudo-membranous form of the disease, are to lessen the amount and plasticity of the exudative material, and to hasten the loosening or disintegration of such plastic material as does accumulate on the surface of the inflamed membrane, it will be difficult to find any agents better calculated to produce these effects than the local bleeding aided by the relaxing and expulsive effects of the sub-sulphate in emetic doses, followed by the alterant and aplastic influence of the calomel and sodium or potassium salts, with such adjuncts as I have already named. In applying

leeches to young children care should be exercised that the number be adjusted to the age and condition of the patient. In infants of one year or less not more than two leeches should be applied at once, and the bleeding may be promoted from the bites by applications of warm wet cloths, or stopped by styptic applications according as the effects produced may indicate. At the time I commenced the practice of medicine much reliance was placed upon the emetic and sedative effects of tartar emetic in the treatment of all grades of laryngitis or croup. But as early as 1840, or near that time, my attention was directed to the use of the yellow subsulphate of mercury as an emetic in this form of disease, by the report of several cases treated successfully, in which it was used by Dr. Hubbard, of New Hampshire. And from that time to the present I have certainly obtained better results from its use as an emetic, than from any other remedy given for the same purpose.

Tracheotomy.— When, in the more severe class of cases of laryngitis, ordinary methods of treatment fail to make any favorable impression on the progress of the disease, the question whether the operation of tracheotomy ought to be resorted to, always comes up for consideration. Most of the writers on practical medicine recommend a resort to it in such cases as persist in the increase of dyspnœa notwithstanding the use of the most active internal and local remedies, and caution the practitioner against delaying its employment until the patient is too much exhausted. This subject was very fully and ably considered by Dr. H. Z. Gill of Jerseyville, Illinois, in two reports to the Illinois State Medical Society, the first in 1879, and the other in 1880.* His tables include 129 cases in which the operation was performed, resulting in 93 deaths and 36 recoveries. A majority of the patients operated on were laboring under well marked diphtheria, the inflammation having invaded the larynx. The remainder of the cases are designated in the tables either as croup, *true* croup, or pseudo-membranous croup. But no attempt is made by the writer to establish a clear line of distinction between these several grades of disease. As the operation was performed in some of the cases at an early period, while the patient's strength was good, it is impossible to know whether they would not have lived if the operation had not been performed. In all the cases of true pseudo-membranous laryngitis coming under my own observation, in which the operation was performed by some one of our best surgeons, death has been the result. Not directly on the operating table, but in from six to seventy-two hours after; and pretty uniformly from the development of inflammation and exudation in the trachea and larger bronchi.

It is well known that cases occur in which patients recover from this variety of disease after their condition appears to be hopeless. Therefore, the question whether the operation for tracheotomy shall be performed in any given case or not, will always be an embarrassing one for the practitioner to decide. I know of no better rule than to try diligently all the measures of treatment affording any prospect of relief until it becomes apparent that there is very *little* chance left for success, yet not carry the delay to the extreme of cyanoses or the commencement of a death struggle, but with everything in readiness beforehand, let the operation be resorted to, just as these extreme conditions are approaching, instead of waiting for their full development.

In such cases as I have described under the head of œdematous laryngitis, consisting of a rapid infiltration of serum into the areolar or con-

* See Transactions of the Illinois State Medical Society for 1879 and 1880.

nective tissue at the base of the epiglottis and between it and the vocal cords, in patients previously debilitated or anæmic, the danger of completely shutting out the entrance of air at almost any inspiration usually makes the delay necessary for obtaining the effects of medical treatment extremely dangerous to the patient, and justifies an almost immediate resort to surgical interference. This interference may be by direct scarification of the œdematous part, as recommended and practiced by Dr. Gurdon Buck of New York, in 1847,* and by M. Lisfranc, at a much earlier period; or by opening of the larynx or trachea, as in the ordinary operations for laryngotomy and tracheotomy. By passing the index finger of the left hand back over the tongue to the base of the epiglottis, the œdematous parts may be felt as rounded prominences, and may be freely incised or scarified by passing a properly guarded bistoury along the finger to the proper place and making two or three incisions into the most prominent part of the swollen tissues.

By the surgeon possessing the extraordinary skill and tact of the late Dr. Buck, such scarifications may be readily and safely made. But those of less experience will find the struggle of the patient for breath, so increased by the presence of the finger which is to guide the bistoury, that it becomes extremely difficult to execute the necessary incisions without danger of injury to other parts. Practically, therefore, it is better and more certain to give relief to the patient, if the larynx or trachea is opened at once by the ordinary method. If the immediate danger of suffocation is obviated by the operation, the subsequent treatment will depend mostly on the nature of the patient's previous sickness and the causes that may have provoked the attack.

The treatment of chronic laryngitis, which occurs mostly in adult life and largely in connection with tubercular phthisis or syphilis, must be guided in a great degree by the nature of the constitutional affections with which it may be associated. If it is associated with tuberculosis the patient will need the same conditions of climate, hygienic relations, and general remedies for correcting the defects in nutrition as in any other case of phthisis ; while if it has a syphilitic origin the use of mercurials and iodides with proper attention to diet and drinks must be your chief reliance. Non-specific catarrhal cases may be treated on the same principles and with the same remedies as I recommended to you in the preceding lecture on corresponding grades of inflammation in the nasal passages and pharynx. So long as no ulceration exists the local treatment should consist of moderate external counter-irritation by stimulating liniments or croton oil; and within the larynx, inhalations of a soothing anodyne and antiseptic nature will produce the best results. The frequent attempts to apply strong astringent and cauterizing remedies by means of the probang or sponge in such cases, are productive of more harm than good.

In cases presenting well marked ulcerations so located that with the use of the laryngoscope you can make an application of nitrate of silver, sulphate of copper, or iodoform, directly to the ulcerated surface, it will in many cases afford much relief. If it does, the application may be repeated every second or third day. But if after two or three applications the result is an increase rather than a diminution of the patient's suffering, they should be discontinued.

In the tuberculous cases all treatment will prove only palliative, but in those of syphilitic origin, even when the ulcerations are extensive, proper constitutional treatment aided by the local applications to which I have

*See Transactions of the American Medical Association Vol. 1, Page 135

alluded, will result in recoveries. In some of these, however, the cicatrices in the larynx cause so much contraction as to permanently destroy the action of the vocal cords, causing incurable aphonia, and in some a degree of dyspnœa. Cases have also occurred in which the epiglottis was so far destroyed by the ulceration as to leave the glottis imperfectly guarded from the entrance of food and drink during deglutition.

LECTURE XLI.

Bronchitis—Acute and Chronic; Catarrhal, Mechanical, Capillary, Rheumatic, and Pseudo-membranous—Their Etiology, Clinical History, Pathological Anatomy and Diagnosis.

GENTLEMEN: By the term bronchitis, I mean inflammation of some part or all of the membrane lining the bronchial tubes, from the bifurcation of the trachea to the air-cells, or alveoli, of the lungs. When the inflammation is produced by atmospheric or climatic influences, it is generally called catarrhal; when from the contact of dust or any irritating particles in the air, it is called mechanical; when it is located mostly in the fibrous structures of the air-tubes, it is called rheumatic; if accompanied by plastic exudation, it is called pseudo-membranous; and when the inflammation occupies principally the smaller bronchial tubes, it is called capillary bronchitis. You may meet with these several varieties of bronchitis in all grades of activity, from the most acute to the most chronic grade of inflammatory action.

History.—Bronchitis has been prevalent, especially in cold and variable climates, from the earliest records of human history; though not differentiated from inflammations of the larynx and trachea on the one side, or from those of the lungs and pleura on the other, until after the commencement of the nineteenth century. Although pretty accurate descriptions of bronchitis as a separate disease were given at an earlier period by Drs. Badham, Frank and Broussais, yet full and accurate descriptions of the disease, differentiating it from inflammation of other parts of the respiratory organs were not given until the discovery of auscultation by Lænnec, and its practical application to the physical examination of the chest. This important addition to the previous means for studying the exact location and extent of all diseases within the chest, and the largely increased attention given, about the same time, to the study of morbid anatomy, soon led to as accurate an appreciation of the existence and extent of disease in any part of the organs of respiration and circulation as in any of the structures of the human body.

Etiology.—The causes of bronchitis, like those of all other acute diseases, may be divided into two classes, namely, predisposing and exciting. Among the most common predisposing causes may be mentioned age, sex, occupation or modes of life, and climatic influences. As a general rule, the several grades of bronchitis are more prevalent during childhood and old age than during the active period of adult life. The British Registrar-General's report for 1868 contained 33,258 deaths attributed to bronchitis, being 1,344 for every million of inhabitants. Of the whole

number 10,550 died during the first *three* years of life, and 18,485 over forty-five years of age, leaving only 4,223 to occur between the ages of three and forty-five years. This, however, is very far from indicating correctly the relative prevalence of the disease at the different periods of life, for the reason that the disease is far more fatal both in early childhood and in old age than in the early and middle periods of adult life.*

During the months of February, March and April, 1882, in San Francisco there were 65 deaths reported from bronchitis, of which 37 were of children under five years of age, 25 of adults over forty years, and only 3 of persons between five and forty years. During the same months there were reported 154 deaths from bronchitis in the city of Chicago, with about the same ratio in regard to age. In the city of Philadelphia during the seven years from 1862 to 1869, the deaths from bronchitis at all periods of life aggregated 969, of which 495 were of children under five years of age; 14 over five and under fifteen years, and 460 of persons over fifteen years of age.†

These and similar mortuary statistics have led to the very general adoption of the opinion that early childhood and old age are pre-eminently susceptible to attacks of bronchitis. Yet my own clinical observations and records relating to the time and number of acute and subacute cases of bronchitis coming under my own care lead to a very different conclusion. By reference to those records I find a larger number of cases occurring between the ages of ten and thirty years than at any other period of life. Thus, during the first six months of the present year (1882) I recorded 59 cases of primary bronchitis, that is, cases not arising secondarily as complications of other diseases. Of this number only 5 were children under ten years of age; 38 between ten and forty years, and 16 over forty. It is probable that similar results will be obtained by all who will take the trouble to record the whole number of cases, instead of simply the number of deaths. The statistics of mortality in relation to this disease are deceptive, not only in regard to relative susceptibility of the human system to attack at the different periods of life, but also in regard to the ratio of mortality of the disease itself. It is generally conceded that the chief mortality from this disease occurs during infancy or early childhood and in old age, cases rarely terminating fatally in youth or the more active period of adult life. Careful examination of cases will show that this fatality at the extremes of life is owing mainly to the greater tendency of the inflammation at those periods to extend directly from the bronchioles into the lobules of the lungs, thereby complicating the bronchitis with lobular pneumonia. And in more than half the cases reported under the head of bronchitis, the fatal result was caused by the pneumonia, instead of the bronchitis.

Sex.—Neither recorded facts nor my own clinical observations show any decided difference in the susceptibility of the sexes to attacks of bronchial inflammation.

The influence of occupations, personal habits, and climatic conditions, as predisposing and exciting causes of inflammation in any and all parts of the respiratory mucous membrane, I explained to you sufficiently in the thirty-ninth lecture of the present course. What I then stated in regard to the causes of inflammation in the respiratory passages generally, is especially applicable to the bronchial part of those passages, and consequently need not be repeated here. I will therefore ask your attention

* See Reynolds' System of Medicine, Amer. Edition, Vol. II p. 318.
† See A Practical Treatise on the Diseases of Children, by J. F. Meigs, M. D., and William Pepper, M. D.; Fourth Edition, page 189.

chiefly to the clinical history of the different grades of bronchial inflammation.

Acute Bronchitis.—The most common form of acute bronchitis, by many writers styled catarrhal bronchitis, acute bronchial catarrh, etc., presents considerable variety of symptoms according to the extent of the membrane involved and the intensity of the inflammatory process. As a general rule the disease commences with slight chilliness or unusual sensitiveness to slight changes of temperature, accompanied by a sense of soreness and oppression behind the sternum and sometimes across the whole chest, with a frequent and rather dry, harsh cough. In many cases there is during the first day or two coincident congestion of the membrane lining the nostrils, fauces and larynx, causing sneezing, with some feeling of soreness in the throat and hoarseness; also a heavy dull pain in the head, much increased by coughing. By the second day a moderate general fever has supervened, characterized by dryness and moderate heat of the skin, flushed face, slight increased frequency and fullness of the pulse, more sense of oppression and soreness in the chest, with a continuance of harsh dry cough, which often causes soreness in the epigastrium radiating laterally in the direction of the attachments of the diaphragm to the inner surface of the ribs. On the second or third day the inflamed membranes begin to be less dry, and the paroxysms of coughing bring up a scanty expectoration of a tenacious, somewhat frothy mucus, which gradually increases until about the fourth or fifth day, when it becomes more opaque, sometimes yellowish, and much more easily expectorated. At the same time that the expectoration changes to a more opaque condition, the general febrile symptoms begin gradually to abate, and the cough is accompanied by less sore pain, both in the chest and head.

In the milder class of cases the decline in all the general symptoms is so rapid that by the seventh or ninth day convalescence is established. But in the more severe cases the more important symptoms may continue through two weeks and convalescence not be complete until the end of the third week. And in some of these cases the inflammation does not disappear on the subsidence of the febrile symptoms, but degenerates into a chronic form, causing a continuance of cough, with some muco-purulent expectoration and slight soreness in the chest, through an indefinite period of time. The disease is most likely to take this course when it occurs in young persons having a scrofulous diathesis; or in connection with eruptive fevers or pertussis; or in the aged afflicted with rheumatism. During the active stage of ordinary cases of bronchitis the urinary secretion is diminished in quantity, redder than natural, and deficient in chloride of sodium; and the bowels inactive.

But after the crisis of the disease is passed, as indicated by the character of the expectoration, the renal and intestinal discharges soon return to their natural condition. The results of auscultation and percussion in ordinary bronchitis, limited to the membrane lining the larger bronchial tubes, are mostly negative. In some instances during the first, or dry stage, the respiratory or vesicular murmur may be slightly harsher or more dry than natural; and after exudation or secretion of mucus, as indicated by expectoration, there may be some coarse moist râles, which are removed temporarily by coughing, but return again in a little time. These râles are heard much more in cases occurring either in infancy or in old age, than in youth or the middle period of adult life. Percussion elicits only the natural degree of resonance throughout the whole course of the disease, except in those rare cases in which complete occlusion of a bronchial tube has taken place, causing exclusion of air from certain

lobules of the lungs, and consequently a shade of dullness on percussion over such lobules.

Mechanical Bronchitis.—By mechanical bronchitis is meant those cases in which the inflammation is caused by the direct action of mechanically irritating substances floating in the inspired air, as fine particles of steel and other metals, particles of stone, charcoal, and various vegetable powders and fungi. Such substances when inhaled are liable to impinge on the surface of the bronchial membrane and produce direct irritation and inflammation, both acute and chronic. Cases originating from this class of causes differ from the ordinary acute bronchitis, chiefly in the mode of beginning and in the greater tendency to continue in the chronic form. Instead of slight rigors, coryza, and early development of moderate general fever, the patient generally complains, first, and for several days, of a sense of tickling or fullness in the air tubes, with occasional paroxysms of violent coughing and little expectoration. Sometimes particles of the foreign substance that is producing the inflammation may be seen mixed with the mucus or matter expectorated. In many of these cases there is much soreness in the chest and considerable dyspnœa, especially during the night, followed by severe coughing in the morning and a more free discharge of mucus, occasionally containing little *streaks* of blood, but which is never intimately intermixed with the sputa as in pneumonia. If the patient, by change of occupation or otherwise, ceases to be exposed to the further action of the exciting cause, the symptoms soon begin to abate and a complete recovery may take place in from two to four weeks. If exposure to the further action of the exciting cause is not avoided the disease will necessarily assume a chronic form, and in many cases produce such changes as to materially shorten the life of the patient.

Capillary Bronchitis.—By this term is meant inflammation in the smaller bronchial tubes, but not necessarily involving the true bronchioles as they terminate in the air-cells. It may arise from all the causes that are capable of exciting inflammation in the larger and medium-sized tubes. It is met with at any period of life, but is most frequent in infancy and early childhood, and next in persons past the middle period of life. The chief differences in the clinical history of this and the ordinary acute bronchitis arise from the greater obstruction to the ingress and egress of air through the inflamed tubes. The same degree of tumefaction of the membrane lining the smaller bronchi that occasions but little obstruction in the larger tubes, is capable of completely obstructing many of the smaller ones, and thereby causing much dyspnœa and sense of oppression, with frequency of respiration, accompanied, at first, by an abundance of dry râles in all parts of the chest, followed later by the complete intermixture of dry sounds and moist sub-mucous râles; the latter caused by more or less exudation or secretion of mucus from the inflamed mucous membrane. The addition of the tenacious mucous exudation to the previous tumefaction of the membrane often so far obstructs the ingress of air to the air-cells of the lungs, that the respiration becomes short, very frequent and noisy, with blueness of the lips, coldness of the extremities, drowsiness and soon death from suffocation. This result, however, is seldom met with except in quite young children and in persons enfeebled by age or by previous disease. In cases which do not thus tend to an early fatal result from the direct obstruction of the bronchi, the respirations continue frequent, in young children sometimes numbering fifty or sixty respirations per minute, with much dyspnœa and restlessness. The pulse is also very frequent but not in proportion to the respirations; the expression of countenance is anxious and often slightly

bloated, with a leaden hue of the prolabia; the wings of the nose expand and the chest heaves with each inspiration, giving a great variety of dry whistling sounds throughout the whole chest, which, after the first two or three days become mixed with sharply defined sub-mucous râles, and in the later stages gives place to the latter entirely. The cough is frequent and inefficient on account of the difficulty of getting sufficient air to make it satisfactory. The temperature varies from 38° to 39.5° C. (101° to 103° F.), seldom rising above the latter figure unless complicated with lobular pneumonia. The urine is generally scanty and deficient in the chlorine salts, and the bowels inactive. The labored efforts of breathing in many cases make the upper and anterior part of the chest appear more prominent than natural, and even more resonant on percussion on account of temporary emphysema from over-distension of the air-cells in those parts, while in some parts of the lower and posterior portions there is less expansion and less resonance than natural from the occlusion of some of the bronchi and the partial obstruction of others, leading to those parts of the lungs.

Between the third and fifth days, usually, the mucous exudation, which up to that time had been scanty and tenacious, becomes more abundant and more opaque, and in two or three days more, assumes a distinct muco-purulent character, and is much more easily expectorated. As that which comes from the smaller bronchial tubes is less mixed with air and consequently less frothy than that which comes from the larger tubes, the two qualities of matter may often be recognized in the same mouthful of sputa; and if the whole be placed in water, that from the smaller tubes will drop lower in the water, or sink to the bottom if detached from the other, which floats freely upon the surface. In acute cases, at the same time that the expectoration becomes more opaque and more easily dislodged by coughing, all the more important symptoms begin slightly to improve, and by the end of the second week convalescence is fairly established. Many cases, however, are less acute, slower in progress, and do not reach convalescence in less than three or four weeks. And many of this class manifest a strong tendency to continue indefinitely in a chronic form, more especially in persons past the middle period of life. In some of the cases that do not continue in a chronic form, the bronchial membrane is left in a condition of such susceptibility that the attack is renewed on the slightest exposure to the exciting causes.

Rheumatic Bronchitis.—Although many systematic writers on practical medicine make no mention of this form of bronchitis, except as a complication of general rheumatic fever, yet cases, both of acute and chronic inflammation of the bronchi, of unmistakable rheumatic character, have so often come under my observation, that I am constrained to recognize it as a distinct form of disease. In regard to the relative frequency of the occurrence of this class of cases, I find in a brief report covering nine hundred and sixty-five cases of chronic pulmonary disease, read in the Medical Section of the American Medical Association, by Dr. F. H. Davis, in 1877, the following classification of the cases:

Chronic catarrhal bronchitis	403
" rheumatic "	283
" bronchitis accompanied by gastric derangement and spasmodic dyspnœa	119
Chronic bronchitis, modified by syphilitic disease	37
Hereditary pulmonary tuberculosis	56

Inflammatory pulmonary phthisis	67
Total	965*

You thus see that of the 842 cases of chronic bronchitis included in the table, the writer classes 283, or a trifle more than thirty-three per cent., as of rheumatic character. That the relative proportion of acute rheumatic cases is less than those of a chronic grade I have no doubt; and yet their number is not so small as to be insignificant or unworthy of careful attention. They differ in clinical history from ordinary acute bronchitis, chiefly in the following particulars: Etiologically, a large proportion of them were in persons of a rheumatic diathesis, either hereditary or acquired, and at those seasons of the year characterized by a predominance of cold and damp air, with frequent changes of temperature. Their clinical history is characterized from the beginning by more continuous dull pain in the chest, often extending to the attachments of the diaphragm, the shoulders, and dorsal portion of the spine; by more persistent, dry, harsh cough, often exhibiting a marked spasmodic character and accompanied by a great aggravation of the pains in different parts of the chest; and when the smaller bronchi are involved, the stage of dry râles is much more protracted, the dyspnœa and suffocative paroxysms of coughing more uniformly aggravated at night, and when mucous exudation does take place it remains scanty and viscid, rarely presenting a distinct muco-purulent character. During the active stage the urine is less in quantity, and more decidedly acid in reaction than natural, and the bowels generally costive. When not interfered with by appropriate treatment, these cases run a much more protracted course, and more frequently degenerate into a chronic form than those of an ordinary catarrhal character. When they are thus allowed to run a protracted course, or to continue in a chronic form, they manifest another tendency of great importance, namely, to have the disease extend, by continuity, from the fibrous and muscular structures of the small bronchi into the connective tissue of the pulmonary lobules, inducing sclerosis of the latter tissue and consequent compression or obliteration of the alveoli, or air-cells, and permanent contraction of the chest. Much and careful clinical observation has satisfied me that many of the cases now classed by writers as *fibrous* and *inflammatory* phthisis, begin as simple acute or subacute bronchitis, which, being renewed at every return of the cold, damp and changeable part of the year, not only ultimately cause permanent thickening of the bronchial structures, but gradually invade portions of the connective tissue of the lungs, and induce similar pathological changes in it, thereby causing obliteration of the alveoli and more or less shrinking of the chest.

Pseudo-Membranous Bronchitis.—This affection has been described by different writers under the additional names of plastic, croupous or croupal, and diphtheritic bronchitis. The extension of the inflammation and membranous exudation to the bronchial tubes in cases of diphtheritic, and pseudo-membranous tracheitis and laryngitis, or croup, is of frequent occurrence. But as a distinct disease, limited to the bronchial membrane, you will meet with it very rarely. In 1854, Dr. T. B. Peacock noticed in the Transactions of the London Pathological Society thirty-four cases collected from European sources. Biermer, in 1867, increased the number to fifty-eight. Kretschy, in 1874, added ten, and Chenstok four more

*See Transactions of American Medical Association, Vol. 28, p. 269, 1877.

cases, making in all seventy-two cases in Europe. In 1879, Dr. W. C. Glasgow, of St. Louis, read to the Medical Section of the American Medical Association an interesting report on the subject of Plastic Bronchitis, in which he notices twenty-three cases which had occurred in this country, accounts of which were obtained from an extensive correspondence with leading physicians in all parts of the United States, as well as from careful search through our periodical medical literature.

These statistics are certainly sufficient to show that the disease is of rare occurrence, both in this country and Europe. The statistics thus far collected, show a much greater prevalence of the disease in males than in females; and that the larger number of cases occur between the ages of fifteen and fifty years, although one case is reported by Dr. T. G. Simons, of Charleston, S. C., as quoted by Dr. Glasgow, at four years of age; and Goumœns, one at seventy-two. In a large proportion of the cases reported, the disease existed in a chronic form. When acute, and affecting a large portion of the bronchial membrane, it is liable to lead to an early fatal termination, from obstruction to the ingress of air to the air-cells of the lungs. But in many cases the disease occupies only a limited number of the bronchi, and recovery has generally taken place in from two to three weeks. The symptoms differ from those of ordinary bronchitis in only two important particulars, namely: the more violent and suffocative character of the cough, and the actual appearance of shreds, patches, or casts of pseudo-membrane in the matters ejected by coughing. The latter is the only reliable diagnostic symptom by which it can be certainly differentiated from all other forms of bronchial inflammation. When the membranous exudation is discharged in shreds or small pieces, it may readily escape the attention of the physician; and even considerable casts when expectorated are, in some cases, so surrounded with mucus and collapsed into a slightly yellowish mass in the central part of the mouthful expectorated that they might be regarded as only a mere muco-purulent part of the mucous secretion. If you throw the whole into water, however, and agitate it a little, the membranous patches and casts will be quickly unfolded in such a manner as to be easily recognized. It is distinguished from mucus, by leaving it in a solution of acetic acid, which causes it to swell, while mucus contracts in a similar solution. It has the appearance of having been formed in concentric layers, and is sometimes cast off so complete as to present a continuous representation of one or both primary and several of the secondary bronchial tubes. Under the microscope it has the same fibrillated appearance as other pseudo-membranous formations.

Chronic Bronchitis.—Cases of acute and subacute bronchitis, belonging to either of the five varieties just described, may be protracted until they assume a chronic form; and other cases of each variety are met with which have been chronic from the beginning. This form of the disease is met with in aged persons, more frequently than at an earlier period of life. In children, it sometimes follows as a sequel of measles and whooping cough, and in adults is often associated with tuberculosis, emphysema, and cardiac diseases.

Etiology.—Chronic bronchitis is capable of originating from any and all the causes that have been enumerated as capable of producing the more acute forms of the disease, and consequently prevails most under the same conditions of topography, climate, and social relations.

Symptoms.—The symptoms of ordinary chronic bronchitis, differ from those accompanying the acute form of the disease chiefly, in the absence of general fever, and the existence of much less pain or feeling of sore-

ness and oppression in the chest. The patient generally complains of a cough, usually more severe on first retiring to bed at night and on rising in the morning, but occurring at intervals through the day, and accompanied by a mucous or muco-purulent expectoration, varying much in its amount and tenacity. In the great majority of cases occurring in young persons and in the first half of adult life, the expectoration is simply a whitish or slightly opaque mucus, more or less frothy from the intermixture of minute bubbles of air, and easily dislodged, especially in the mornings. In old persons, and in cases which have continued a long time, the expectoration often becomes more copious and more decidedly purulent, with slight feverishness at night, and some loss of flesh. In all the cases, except those last mentioned, the general health of the patients is but little impaired, the appetite and secretions usually remaining nearly natural. Those pursuing indoor occupations, or are sedentary in their habits, will be prone to constipation and imperfect digestion, more, however, from the circumstances just mentioned, than from the effects of the bronchial disease. All cases of chronic bronchitis are subject to temporary aggravation, by exposure to a cold and damp atmosphere, whether indoors or out; and are also very susceptible to increase from the inhalation of air, containing dust or floating particles of solid matter, or of irritating gases. Cases of ordinary chronic bronchitis, rarely prove fatal without the intercurrence of some other disease, and yet there is no natural limit to their duration. In many cases the symptoms almost disappear during the warm months of summer, but return with the first period of cold and wet weather of autumn. Such patients usually find permanent relief by changing their residence to a mild and dry climate.

The symptoms of the rheumatic grade of chronic bronchitis differ from those just described, mostly in the more severe paroxysmal character of the cough, with either no expectoration or only a scanty quantity of a glairy, tenacious mucus; more soreness or dull pain in the intercostal muscles and attachments of the diaphragm; and in the more marked influence of sudden and severe meteorological changes. Perhaps the most marked and distressing cases of this variety of bronchitis are those we occasionally meet with in old persons, whose joints, especially those of the extremities, have long been stiffened and sometimes enlarged from chronic rheumatism, and who are harassed and worn from a harsh, suffocative cough, the worst paroxysms of which are always during the latter part of the night and the early morning, accompanied by the expectoration of considerable quantities of a thick, viscid, and very tenacious mucus, which is dislodged with so much difficulty that in the midst of the more violent paroxysms of coughing the action of the stomach is reversed and its contents ejected by vomiting. This is very liable to happen just after breakfast and occasions the loss of the morning meal. The condition of these patients is very generally ameliorated during the warm months of summer, but on the whole they emaciate and grow more helpless from year to year, until they die from either exhaustion or the supervention of pulmonary sclerosis (fibroid phthisis), endocarditis, or chronic diarrhœa. There is one grade of rheumatic irritation which is liable to attack the fibrous texture of the smaller bronchi, and to give rise to a very persistent form of asthma, which increases with every returning cold season of the year, but as asthma in all of its forms is treated in other parts of this work, I only allude to it in this connection.

Pathology and Morbid Anatomy.—The special pathology of inflammation involving the mucous membrane and other structures of the bronchi does not differ from that of similar grades of inflammation in any other

structures of the body. In the early stage of acute bronchitis you will find more or less intense congestion of blood in the vessels, causing redness and tumefaction of the membrane, soon followed by an increased flow of mucus, with increase or proliferation of mucous corpuscles and epithelium cells.

In pseudo-membranous or croupous variety of bronchitis, you will find the bronchial tubes lined, and in some cases, filled with a plastic exudation. Usually, only a limited number of the bronchi are affected. The tube casts that may be expelled are generally in the form of balls that may be unrolled, and which will then be found to be fragments of the pseudo-membrane, or complete cylindrical casts of the tubes. They are, when expelled, usually yellowish and often tinged with blood. When washed they are usually white. There are frequently points of enlargement along the casts, which are caused either by the presence of air-bubbles within them, or by a more rapid exudation from that point on the bronchus. The largest casts are usually solid and laminated in structure; the smaller ones more frequently are hollow, containing a greater or less number of air-bubbles; the smallest consist of a single solid thread. Under the microscope the casts seem to be composed of a structureless or fibrous substance, holding numerous mucous and pus cells, more or less numerous globules of fat, and occasional epithelial cells; seldom red blood corpuscles, although these may be numerous on the surface.

The casts are usually moderately compact, firm and elastic. Toward the end of the disease, however, they may be less firm. In some cases toward the close of life epithelial cells are abundant in them, but in other cases on post mortem examination the epithelial lining of the bronchi is found nearly or quite entire. The mucous membrane may be much reddened, or on the other hand, paler than normal. The sub-mucous tissues are also sometimes involved in the swelling, and occasionally infiltrated with serum, while leucocytes or white corpuscles are seen permeating the capillary walls and penetrating the sub-mucous tissue, or mingling with the increased epithelium upon the surface. The several inflammatory products are seen adhering to the surface of the inflamed membrane and in the smaller tubes, often so filling their caliber as to greatly interfere with the ingress and egress of air through them, and of course adding to the dyspnœa that characterizes the capillary form of bronchitis. During the later stages of the disease you will see pus corpuscles freely intermingled with the mucus, and owing to the exfoliation of much of the epithelium, the surface of the mucous membrane often appears irregular, abraded, or ulcerated. When the inflammation has been protracted into a chronic form, the vessels appear less congested, but the cell proliferations continue both in the mucous and sub-mucous structures, causing thickening and increased density, with a still more purulent quality of secretion. The bronchial glands are also sometimes seen enlarged, and either softened, colored with pigment, or, more rarely, calcified. In addition to the foregoing changes, in many cases of the capillary form of bronchitis you may find some lobules of the lungs collapsed from the complete occlusion of the bronchi leading to them, by the accumulation of tenacious mucus with other inflammatory products. And in the same cases the air-cells in other parts of the lungs, more frequently the upper and anterior parts, are enlarged from over-distension constituting a degree of emphysema. In very chronic cases, especially of the rheumatic variety, you may find considerable hypertrophy of the connective tissue of the bronchi, and in other cases atrophy of the same tissue, the latter generally accompanied by more or less dilatation of the tubes.

For a representation of one of the most complete specimens of pseudo-membranous casts from the bronchi, the reader is referred to the paper of Dr. Glasgow in the transactions of the American Medical Association, already referred to.

Diagnosis.—The principal diseases from which acute inflammation of any part of the bronchial mucous membrane needs to be differentiated, are pneumonia, pleurisy, laryngitis, tracheitis, and asthma, while it is still more important to keep a clear line of diagnosis between the chronic grades of bronchial inflammation and the earlier stages of pulmonary phthisis and of emphysema. From nearly all the diseases named it is separated by negative evidence or the absence of symptoms and physical signs which necessarily exist in those affections. You find in bronchitis neither the rusty expectoration, nor high temperature, nor fine crepitant râles of pneumonia; nor the acute pains or short, stifled cough or friction sounds of pleurisy in the early stage; and still less will you find in the middle and later stages, any of the dullness on percussion that characterizes the corresponding stages of the other two diseases. In true asthma the active symptoms are distinctly paroxysmal, without fever or increase of temperature, and the respirations during the paroxysms are slow, with marked prolongation of the expiratory act; while in bronchitis, both in the larger and smaller tubes, the symptoms are continuous, the temperature increased, and the respirations more frequent than natural. All grades of bronchitis are easily distinguished from laryngitis and tracheitis by auscultation, which will enable you to trace all the morbid sounds to the chest in the former, and to the front part of the neck in the two latter. The great advantage to the patient of having pulmonary tuberculosis, and other forms of phthisis, recognized in the early stage of the disease, makes the diagnosis between it and chronic bronchitis a matter of primary importance. This you can readily do if you take the trouble to acquire a reasonable degree of skill in the practice of auscultation and percussion. In all forms and stages of pulmonary phthisis, whether from primary tubercular deposits, pneumonic exudation followed by caseous degeneration, or from interstitial fibroid sclerosis, you will find increased vocal fremitus and diminished resonance on percussion; neither of which are present in any grade of uncomplicated bronchitis.

It is true that in the advanced stage of some very severe cases of capillary bronchitis there occurs sufficient œdema to increase the vocal fremitus and diminish the resonance over some parts of the chest. But the accompanying symptoms and immediately preceding history of such cases is sufficient to separate them from any stage of phthisis.

The same remark is applicable to those rare cases in which an attack of pseudo-membranous bronchitis results in the complete occlusion of one or more of the bronchi and the permanent collapse of the pulmonary lobules to which the occluded tubes lead. If in addition to the plain difference in the physical signs already mentioned, you remember that in all the forms of phthisis there is progressive loss of flesh, some increase of temperature, and acceleration of pulse, with a contraction of the antero-posterior diameter of the upper part of the chest, while none of these changes usually result from bronchitis alone, you will find no difficulty in keeping the line of diagnosis clear between these two diseases. And yet there is probably no more frequent or important error committed in diagnosis than that of mistaking the early stage of pulmonary phthisis for bronchitis. This may arise in part from the fact that bronchitis often supervenes and continues coincidently with phthisis. But you must remember that whenever there is increased vocal fremitus and diminished resonance in

any given case, there is some altered condition of the lung structure, and consequently some form of disease besides bronchitis, however plain the ordinary symptoms of the latter may be at the same time. You can distinguish pulmonary emphysema from chronic bronchitis by the abnormally increased resonance from percussion in the former, especially over the upper and anterior parts of the chest, and in the peculiar depression of the spaces above the clavicles and between the ribs at the beginning of the inspiratory act, and their return to over fullness near its close, while none of these changes accompany any grade of simple bronchial inflammation.

LECTURE XLII.

Bronchitis—Its Varieties continued; Their Prognosis and Treatment. Asthmatic Bronchitis—Catarrhal Asthma—Hay-Fever; Their Clinical History and Treatment.

GENTLEMEN: In the preceding lecture I directed your attention chiefly to the clinical history of the different varieties and grades of bronchitis, the pathological changes which take place in the inflamed structures during their progress, and their diagnosis or differentiation from other affections of the respiratory organs. I now direct your attention to their prognosis and treatment.

Prognosis.—The prognosis in bronchitis depends much upon the particular part of the membrane affected, the grade of the inflammatory process, the age, and the previous condition of the patient. When the inflammation is limited to the lining of the larger and medium sized air tubes, and is not of the plastic or pseudo-membranous variety, there is but little tendency to produce fatal results at any period of life, especially if the patients have not been debilitated by previous disease or affected by some constitutional predisposition. When the membrane lining the smaller tubes is the seat of disease, constituting capillary bronchitis, there is more danger to life, especially in young children and in old persons. In the more severe attacks involving both sides of the chest, the obstruction to the passage of air through the smaller bronchi, caused by the congestion and rapid accumulation of inflammatory products occurring in infancy or in those much enfeebled by age, death from apnœa or insufficient supply of air to sustain the function of respiration, is liable to occur in from three to seven days. Another source of great danger in this class of cases is from the supervention of lobular pneumonia. For these reasons the capillary form of acute bronchitis has resulted in a moderately high ratio of mortality.

The pseudo-membranous variety of the disease is still more dangerous, especially when the inflammation invades a large number of the bronchi; and for the obvious reason that the adhering plastic material constituting the false membrane, being difficult to dislodge, is much more liable to accumulate until it presents a fatal obstruction to the ingress of air. When the disease is limited in its extent or is of a chronic grade of activity there is a good prospect of recovery. The duration of acute

bronchitis of all varieties, when it ends in the recovery of the patient, is from one to three weeks. The chronic forms of bronchitis, when uncomplicated by other diseases or constitutional cachexias, seldom terminate fatally; and yet they manifest no tendency to a self-limited duration. Many of this class of cases improve much during the warmest months of summer, and are regularly aggravated by the return of cold and wet changes in the autumn. In other cases you will find the changes of the seasons to produce but little effect on the symptoms or progress of the disease, and yet the patients live out their three score and ten years.

Treatment.—The indications to be fulfilled or objects to be accomplished in the treatment of the different grades of bronchitis, are the same as I have stated to you in speaking of the treatment of inflammation in other parts of the respiratory mucous membrane, namely: to diminish the morbid excitability of the inflamed structure; to lessen the local hyperæmia and thereby limit the amount of exudation and accumulation of inflammatory products; to counteract secondary functional disturbances by lessening febrile heat and promoting the eliminations from the skin and kidneys, and to hasten the disintegration and removal of such plastic exudations as may have taken place either upon the surface or into the texture of the inflamed membrane. Of course, you must at all times give due attention also to the regulation of the diet, drinks, exercise, clothing, temperature and all other hygienic matters influencing your patients.

The three first objects I have named as desirable to accomplish belong more particularly to the early stage of acute and subacute attacks, but are present in some degree throughout the whole course of the disease; while the last belongs to the later stages of the acute, and to all stages of the chronic grades of the inflammation. While the foregoing indications to be fulfilled or objects to be accomplished, are present in all the various grades and stages of inflammation of the bronchi, the particular *means* for accomplishing them will be modified by the age and previous physical condition of the patient; the nature of the predisposing and exciting causes; the extent of the disease, and the stage of its advancement; or, in other words, the nature and extent of the pathological changes already accomplished. For instance, the same remedial agents that would be most efficient in relieving the morbid excitability and the vascular fullness of the first stage of acute inflammation in a young or middle-aged, and previously healthy, vigorous subject, might be positively injurious or even fatal if used in the same stage of inflammation in a subject previously anemic and feeble, or debilitated from age, or from causes capable of impairing the quality of the blood and favoring a typhoid condition of the system. Consequently the practitioner, who not only sees clearly the objects most desirable to accomplish, but who most judiciously selects and adjusts the means or agents he uses to the special conditions of each patient, will meet with the highest degree of clinical success. In the first stage of acute attacks, involving the bronchi of both lungs, in vigorous adult persons, and especially if the inflammation extends into the smaller tubes causing much dyspnœa and dry râles, there is no single remedy that will so certainly and speedily check the intense engorgement of vessels in the bronchial membrane, and thereby gain time for the action of other remedies, as one prompt and liberal abstraction of blood by venesection. In cases of a little less severity, and in children, the application of from two to twelve leeches to the upper and anterior part of the chest, the number being regulated by the age of the patient, will be a good substitute for the venesection. And in case leeches are not at hand, extensive dry cupping over both the anterior and posterior parts of the

chest, may be applied with much benefit. Immediately after the venesection, leeching, or cupping, and without these, in cases of only ordinary severity, the whole chest may be enveloped in an emollient poultice or in folded napkins, wet in warm water and covered with oiled silk; and at the same time the following combination may be given internally:

℞	Liquor Ammonii Acetatis,	60.0	c. c.	ʒii
	Tincturæ Opii Camphoratæ,	75.0	"	ʒiiss
	Vini Antimonii,	15.0	"	ʒss
	Tincturæ Veratri Viridis,	6.0	"	ʒiss

Mix. Give to an adult four cubic centimeters, or one teaspoonful, in a tablespoonful of water, every two, three, or four hours according to the severity of the case. The same may be given to children, the dose being properly adjusted to the age of the child. If you find the tongue coated, the bowels inactive, and urine high colored, from six to thirty centigrams (gr. i to v) of calomel, according to the age of the patient, may be given and followed in four or five hours by a saline laxative sufficient to procure two or three evacuations from the bowels. Under the influence of these remedies, the high fever and great sense of soreness and oppression in the chest, which exist in the first stage of the more acute cases, in previously healthy subjects, rapidly diminish, giving place to more moist râles, easier breathing, and some expectoration. As soon as such amelioration of symptoms has been obtained, you may discontinue the mixture containing veratrum viride, and substitute the following formula, in its place:

℞	Syrupus Scillæ Compositi,	45.0	c. c.	ʒiss
	Tincturæ Sanguinariæ,	15.0	"	ʒss
	Tincturæ Opii Camphoratæ,	60.0	"	ʒii

Mix. Give to an adult four cubic centimeters, (fl. ʒi) in a little additional water, every three or four hours. If the patient suffers much from severe, sore pain in the head, aggravated by coughing, or from nervous restlessness, you may add of bromide of potassium sixteen grams (ʒiv) to the above formula, which will render it more efficient in relieving those symptoms and in promoting rest. Under such quieting and expectorant influence, aided by a mild laxative when needed, the cough, soreness and oppression in the chest, and all other active symptoms, usually diminish from day to day, and convalescence ensues in from seven to nine days. If, after the first three or four days, you find the temperature to rise in the evening and the cough to become more troublesome, interfering with rest during the first part of the night, followed by some sweating in the early morning, a single dose composed of sulphate of quinia from three to six decigrams (gr. v to x) pulverized sanguinaria root three centigrams (gr. $\frac{1}{2}$), and codeine sixteen milligrams (gr. $\frac{1}{4}$), given between six and eight o'clock each evening, for three or four evenings, will often contribute much to the rest of the patient and hasten the establishment of convalescence. You will sometimes meet with cases, especially in patients debilitated by previous ill-health or age, in which the fever subsides after the first three or four days, leaving the patient with a feeling of unusual weakness, a deep, harassing cough and copious muco-purulent expectoration, and little or no appetite. In such cases tonics and the more stimulating class of expectorants are indicated. You can give a mixture of equal parts of the syrup of prunus virginiana, syrup of senega, and camphorated tincture of opium, in doses of four cubic centimeters or one tea-

spoonful every four or six hours, and thirteen centigrams (gr. ii) of quinine three times a day, and it will generally produce a rapid improvement in all the symptoms. In some of the cases last described there is added to the other symptoms a troublesome nausea and disposition to vomit with the paroxysms of coughing, in which I have found the following formula a good substitute for the mixture containing the prunus virginiana and senega:

℞	Acidi Carbolici,	0.50 grams	gr. viii
	Glycerinæ,	30.00 c. c.	℥i
	Tincturæ Opii Camphoratæ,	60.00 "	℥ii
	Aquæ,	60.00 "	℥ii

Mix. Give four cubic centimeters (fl. ʒi), or one teaspoonful before each meal time and at bed time, giving the quinine a little after the meals. If more anodyne influence is required to procure rest at night, you can add sixteen milligrams (gr. ¼), of codeine to the teaspoonful of carbolic acid mixture, given at bed time.

If, as sometimes happens in cases of acute bronchitis, both of the catarrhal and capillary varieties, the inflammation invades some of the lobules of the lungs, as indicated by undue rise of temperature, greater expansion of the wing of the nose during inspiration, with short expiration, and diminished resonance with fine crepitation over limited portions of the chest, you will find the most certain and speedy relief to follow the application of a blister over the seat of the pneumonia and the internal use of the following formula:

℞	Ammonii Muriatis	12.00 grams	ʒiii
	Antimonii et Potassii Tartratis	0.13 "	gr. ii
	Morphiæ Sulphatis	0.20 "	gr. iii
	Extracti Glycyrrhizæ Fluidi	30.00 c. c.	℥i
	Syrupus Simplicis	90.00 "	℥iii

Mix. Give to adults four cubic centimeters (fl. ʒi), mixed with a tablespoonful of water every three or four hours, until some relief is obtained, and then at longer intervals. For children you should diminish the doses in proportion to the diminution of age. Quinine and laxatives may be used in these cases, under the same indications as in uncomplicated bronchitis. In the severe attacks of capillary bronchitis in young children many writers recommend emetics and subsequently nauseating doses of antimony or ipecacuanha. But I have not seen sufficient benefit to result from emetic doses of these agents to compensate for the early prostration, and sometimes continued gastric irritability, which they are liable to induce. I prefer the proper application of leeches at the very beginning, followed by emollient applications to the chest, and the same remedies internally as already mentioned, aided, perhaps, by an earlier use of quinine and digitalis, if the cardiac action becomes weak and frequent. In all this class of cases, however, much caution should be exercised in regard to the use of opiates, either alone or in combination with other remedial agents, lest their narcotizing influence should diminish the force and frequency of the respiratory movements too much, and encourage the accumulation of the inflammatory products in the smaller bronchi to such a degree as to produce apnœa or death from the exclusion of air from the alveoli, or air-cells of the lungs. And yet, just enough of

these quieting agents to diminish excitability and allay excessive restlessness is as desirable in children as in adults. In the *plastic*, or *pseudo-membranous* form of bronchitis it is an object of much importance, in the first stage, to limit the amount of plastic exudation, and later, to hasten the loosening and disintegration, or discharge of such layers of false membrane as may have formed on the bronchial mucous surface. For these purposes you may give alterative doses of calomel alternately with the doses of the formula containing the liquor ammonii acetatis already given, during the first twenty-four hours; and subsequently, pretty full doses of the iodides of sodium or potassium, or of the bi-carbonates. In acute cases in children, when the symptoms indicate that the false membrane is loosening and the dyspnœa is great, an emetic that will induce prompt and free vomiting may hasten its expulsion and afford much relief. In the cases which I have described as *rheumatic* bronchitis of the more acute or active grade, the most prompt and satisfactory degree of relief has been obtained by the administration of the following combination of remedies in the early stage:

℞	Sodii Salicylatis	25.00 grams	ʒvi
	Glycerinæ	15.00 c. c.	ʒiv
	Vini Colchici Radicis	25.00 "	ʒvi
	Syrupus Scillæ Compositi	45.00 "	ʒjss
	Tincturæ Opii Camphoratæ	60.00 "	ʒjj

Mix. Give four cubic centimeters (fl ʒi) every three or four hours, in a little additional water. In several cases in which this grade of inflammation was located chiefly in the smaller bronchi, causing very distressing and persistent dyspnœa, I have given an equal mixture of the wine of colchicum root and the acetated tincture of opium, in doses of twenty-five to thirty minims every three hours at first, with more benefit than any other remedies I had used. And after some degree of relief had been obtained by lengthening the interval between the doses to four or six hours, and continuing it a few days, all the symptoms were removed.

When the disease occurs in old persons, accompanied by severe paroxysms of coughing, and only a scanty and very viscid mucous expectoration, much benefit may sometimes be derived from the use of the carbonated alkalies, such as the carbonate of ammonium, or bi-carbonate of sodium, dissolved in an equal mixture of the fluid extract of the phytolacca decandria, liquor ammonii acetatis, and camphorated tincture of opium, in such proportion that the patient will get three decigrams (gr. v), of carbonate of ammonium in each dose of the mixture. It is proper to remind you, however, that there are many mild attacks of bronchitis, caused by exposure to sudden and severe meteorological changes, which, if seen during the first twenty-four hours, can be speedily arrested by a hot or stimulating foot bath and a full dose of the compound powder of opium and ipecacuanha (pulv. Doveri), taken in the evening, and followed the next morning by a saline laxative, and two or three moderate doses of quinine during the day. Similar results can also be obtained, in some cases, by the use of any agents that will allay irritability and at the same time produce a free or copious elimination from the skin and kidneys. An efficient diaphoretic dose of pilocarpin, or a full warm bath, followed by two or three moderate doses of quinine will succeed well if employed in the initial stage of the disease. Unfortunately, but few patients will apply to you for aid until after this stage has passed.

Treatment of Chronic Bronchitis.—Most of the cases of chronic bron-

chitis are treated satisfactorily by a more moderate use of the same remedial agents that have been recommended in the acute and subacute grades of the disease; aided by a judicious regulation of diet, dress and exercise. In a great majority of the cases of ordinary chronic bronchitis the formula already given, containing the muriate of ammonium, or the one containing the compound syrup of squills, if given to adults in doses of four cubic centimeters (fl ʒi) before each meal and at bed-time, mixed with a table-spoonful of water, will afford the necessary relief without confining the patients to the house. If the bowels become constipated while using either of these prescriptions, the evil may be obviated by taking one of the following pills every evening:

℞			
	Extracti Hyoscyami	2.00 grams	gr. xxx
	Ferri Sulphatis,	2.00 "	" xxx
	Pulveris Aloes,	2.00 "	" xxx
	Pilulæ Hydrargyri,	2.00 "	" xxx

M. ft. pillulæ, xxx—If one pill taken every evening does not prove sufficient to prompt one natural intestinal evacuation each morning, you can order another to be taken after breakfast. The patients should adhere to a plain, nutritious and easily digestible diet, avoiding the use of all varieties of alcoholic drinks; wear good flannel underclothes all the time; and take moderate daily out-door exercise, so long as their strength will permit. In addition to the several remedies that have been mentioned as applicable to the treatment of the different varieties of acute and subacute bronchitis, there are many others which I have found more or less beneficial in the treatment of chronic cases. Among the more important of these are the iodides of potassium and sodium, the grindelia robusta, eucalyptus globulus, œnothera biennis, cimicifuga racemosa, asclepias tuberosa, balsams copaiba and tolu, gum benzoin, turpentine, cod-liver oil, and the hypophosphites of soda, lime and iron. Others have used a still larger number of remedies by inhalation. As a general rule, where you find the cough harsh and the expectoration scanty, with the predominance of dry râles, you will obtain the best results from the use of such remedies as the muriate and iodide of ammonium and the iodides of potassium and sodium, given in conjunction with small doses of antimony and some mild anodyne. On the other hand, if you find the expectoration abundant and of a muco-purulent character, the balsamic and terebinthinate remedies given in connection with such tonics as the lacto-phosphate of calcium, phosphate of iron, sulphates of quinine and strychnine, with codia, hyoscyamin, or lupulin at night, to procure rest, will afford the greatest relief. In some of these cases I have obtained very good effects from a combination of two parts of the syrup of iodide of calcium with one of the fluid extract of hops, given in doses of four cubic centimeters (fl ʒi) each morning, noon, tea-time, and bed-time. When chronic bronchitis is complicated with pharyngitis and laryngo-tracheitis much palliative influence may be obtained by judiciously directed inhalations, either in the form of vapor or atomization. But when the disease is limited to the bronchi alone, inhalations produce much less influence over its progress, or in relieving the more distressing symptoms. And unless the nature of the material used is judiciously selected with reference to the particular stage and grade of the disease, the inhalations will be more likely to do harm than good. There are two conditions of the bronchi met with in different cases of chronic bronchial inflammation, to which local applications can be made in the form of vapor, by inhalation, with much benefit.

The first is indicated by an abundant purulent or muco-purulent expectoration, sometimes fetid and at other times not. For such the full deep inhalations of aqueous vapor impregnated with some antiseptic and anodyne, will be of great service. One of the best combinations that can be used for this purpose is that of carbolic acid with camphorated tincture of opium in the proportion of two grams of the former (gr. xxx) to ninety cubic centimeters (℥iii) of the latter.

Four cubic centimeters (fl. ʒi), of this mixture may be put into 250 cubic centimeters (fl. ℥viii), of hot water in an inhaling bottle, and the vapor inhaled freely five minutes at a time two or three times each day. The second condition alluded to is characterized by a persistent, harsh, irritative cough, with little or no expectoration, indicating a sensitive and congested condition of the mucous membrane, with no natural secretory action. Such cases may generally be much relieved by adding to the antiseptic and anodyne mixture just given, some one of the oleo-resin or balsamic preparations, of which, perhaps, none are more efficient than that which is known in the shops as oil of Scotch pine. Four cubic centimeters (ʒi), of this may be added directly to the quantity of the other ingredients already given, and then used in the same manner. The combination thus used appears to allay the morbid sensitiveness and speedily establish a better secretory action. There is another important class of cases, met with most frequently in persons of both sexes between twelve and twenty years of age. They present a narrow, imperfectly developed chest, with so sensitive a condition of the bronchial membrane that every trifling exposure to cold and damp air renews the vascular hyperæmia and cough until both become permanent, and the morbid process extends into the connective tissue of the pulmonary lobules, establishing what some call interstitial pneumonia, and others, fibroid phthisis. In the earlier stage of all of this class of cases the systematic daily practice of full, deep inhalations of pure atmospheric air, coupled with a judicious exercise of the muscles of the chest and arms will do more to remove all symptoms of bronchial disease and preserve the general health of the patient, than all the medicines that have been hitherto devised. There is much evidence in favor of using compressed air for inhalation in these and some other cases of chronic bronchial inflammation. The late Dr. F. H. Davis, of this city, who, during his brief professional career, gave much attention to the treatment of diseases of the respiratory organs, and who had good opportunities for clinical observation, says, when speaking of the same class of young subjects, that, "The inhalation of compressed air for from five to ten minutes once or twice a day produced marked and rapid improvement in all the cases. The size of the chest, on full inspiration, was increased from one-half inch to one inch in the first month, and a habit of fuller, deeper breathing and a more erect carriage was established."*

But he adds, with proper emphasis, that the inhalations to be permanently curative must be continued faithfully for many months, and be accompanied by a judicious regulation of all the habits of life. Every physician of much practical experience knows, however, that in defiance of all the remedies and methods of treatment hitherto devised, there are many cases of chronic bronchial inflammation which will continue and be aggravated at every returning cold season of the year so long as the patient lives in a climate characterized by a predominance of cold and damp air, with frequent and extreme thermometric changes. And yet a large proportion of these, by changing their residence to a mild and comparatively dry

* See paper read before the Chicago Society of Physicians and Surgeons, April, 1877, on the Respiration of Compressed and Rarified Air in Pulmonary Diseases.

climate, either greatly improve or entirely recover. Consequently, in all the more severe and persistent cases such a change is of paramount importance, and should be made whenever the pecuniary circumstances of the patient will permit. Probably the best districts in our own country to which the class of patients under consideration can resort are the southern half of California, the more moderately elevated places in New Mexico and the western part of Texas, Mobile in Alabama, Aiken in South Carolina, and most of the interior parts of Georgia and Florida. My own observations lead me to the conclusion that the unfortunate invalid suffering from any grade of bronchial inflammation can find in some one of the regions I have named, all the relief that he could gain in the most celebrated health resorts on the other side of the Atlantic.

In cases accompanied by known scrofulous or other cachectic conditions involving general impairment of nutrition in which sea air, in connection with mildness of climate would be desirable, the Bermuda Islands may be resorted to with a prospect of much benefit. In selecting places of resort for the classes of invalids under consideration, care should be exercised to prevent their choosing a residence on a *wet soil* on the one hand, or in a region subject to much dust, sand, or other particles of matter floating in the air, on the other. The latter constitutes a serious objection to many parts of the elevated plains lying on either side of the great mountain chain running parallel with our Pacific coast You should also remind all these patients that faithful adherence to strictly temperate and judicious habits of life, with regular daily outdoor exercise, is essential to their welfare in whatever climate they may choose to live.

Asthmatic Bronchitis—Catarrhal Asthma—Hay Fever.—Perhaps there will be no better time during the college term than the present, to call your attention to a brief consideration of certain morbid conditions of the bronchi, which involve both an undue sensitiveness and congestion of the lining membrane to such a degree as to approximate closely a true inflammatory condition. The cases which will come to you under the popular name of asthma, may be divided into two classes. The cases belonging to one class, are characterized by paroxysms of dyspnœa of temporary duration, with intervals of entire absence of all respiratory symptoms or febrile phenomena. These are dependent on some form of nervous derangement, either direct or reflex, and consequently will receive due attention in the third division of local diseases. Those belonging to the other class are characterized by some degree of persistent morbid sensitiveness of the mucous membrane, both of the nasal and bronchial passages, with more or less frequent attacks of dyspnœa, generally aggravated during the night, partially subsiding during the day, and lasting from three or four days to as many months. This class of cases are divisible clinically into three groups. The first group embraces such cases as are associated with a chronic, rheumatic or gouty diathesis or are symptomatic of renal or cardiac diseases. In such, the paroxysms of bronchial constriction or asthma occur at entirely irregular intervals, or whenever accidental causes supervene, without regard to special periodicity or season of the year. The second group embraces such cases as recur at the commencement of every cold season and continue with varying degrees of severity until the commencement of the following summer. The third group embraces those peculiar cases which are strictly periodical, recurring at a given time during the warm season of each year, some commencing in June, some in July, and a much larger number in August, and consequently are popularly called hay asthma, or hay fever. In the first group of cases the symptoms during the intervals between the paroxysms belong

rather to the associated constitutional or local affections, than to the bronchial trouble; yet in nearly all of them there is slight habitual cough and shortness of breath with some wheezing whenever attempting very active exercise. In most instances the active paroxysms commence in the night, without any premonitory nasal or catarrhal symptoms, and are characterized by great sense of tightness or constriction in the chest, extreme dyspnœa, the act of inspiration and expiration being both difficult and prolonged as if the air was forced through very narrow tubes and accompanied both in the ingress and egress by all grades of dry sounds, from the rough and sonorous to the finest, sibilant and piping. The patient is obliged to sit upright, and presents a rather full and anxious expression of countenance; slight elevation of temperature; moderate acceleration of the pulse; cool and congested appearance of the surface of the extremities; suspended digestion; inactive state of the bowels, and the urine sometimes copious and limpid as water, at others scanty and high colored.

As the morning approaches the dry râles become mixed with sharply defined sub-mucous râles and more frequent attempts to cough, with a scanty amount of white, frothy expectoration. The patient complains of great weariness and desire to sleep, without the ability to do so. In most cases by daylight, the dyspnœa has so far abated that the patient can recline at an angle of forty-five degrees, and sleep from ten to fifteen minutes at a time, from which he rises suddenly to the upright position and coughs harshly, with more expectoration of thick, tenacious mucus, and more decided moist râles in the chest. The partial relief thus gained usually continues through the fore part of the day, and in some instances until eight or nine o'clock in the evening. But all the more severe symptoms return at night and pursue the same course as during the preceding night and morning. If not interfered with by appropriate treatment, the same series of phenomena usually continue from two to seven days, when all the more distressing symptoms rapidly disappear, coincident with a critical evacuation either through the skin, kidneys, or bowels, which leaves the patient enfeebled but comfortable. In the second group of cases there are no recognizable symptoms during the warm months of summer except an unusual tendency to catarrhal congestion in the nostrils on slight exposures to currents of air, or sudden atmospheric changes. But during the cold, wet and changeable weather of the latter part of autumn the regular paroxysms are usually ushered in by the same symptoms as an ordinary attack of influenza. There are rigors, followed by moderate general fever, dull pains in the head and back, stuffing of the nostrils, and slight soreness of the throat. In two or three days the febrile symptoms have disappeared and the catarrhal irritation in the nostrils is subsiding, but as night comes on the patient feels a sense of tightness with slight dry wheezing in his chest, and a little disposition to cough. He retires at the usual time but has hardly become unconscious in sleep, before he is aroused by dyspnœa and all the symptoms described as characterizing the paroxysms in the first group of cases. The asthmatic part of the difficulty having thus begun, usually continues in some degree throughout the whole of the cold season of the year. The dyspnœa and dry râles are pretty uniformly increased during the first half of the night, but lessened with more moisture toward morning, ending in considerable coughing and mucous expectoration in the morning; and usually after the first week or two the patient is able to be up and attending to some work or business during the day and suffering only moderately during the night. In some cases during the steady, dry cold of mid-winter all symptoms will

so far disappear as to allow the patient to appear quite well; but they are pretty uniformly renewed with more or less severity by every marked change involving cold and damp air. In some cases, however, the disease is so severe and continuous that the patient is obliged to keep in-doors and be bolstered up in bed or sit in a chair every night during the cold season, unless he flees to a mild and dry climate. Cases belonging to this group may occur at any period of life, but you will meet with them far more frequently in patients over forty years of age than at an earlier period. Pathologically this group of cases would appear to consist of a mild grade of chronic bronchitis involving such a morbid sensitiveness of the bronchial nerves as to add the constricting influences which cause the distressing dyspnœa that so torments the patient and robs him of rest at night. In the third group of cases the patients usually present no symptoms of irritation or trouble of any kind in the air passages, in the interval between the attacks. But suddenly, at some particular time each summer, they are attacked with coryza or symptoms of simple irritation of the Schneiderian membrane. In from one to three days this subsides, but coincident with such subsidence the patients begin to feel the sense of tightness in the chest which soon culminates in a full paroxysm of dyspnœa with all the symptoms mentioned in describing the paroxysms in the first group of cases. The regular increase of all the symptoms at night prevents the patients from taking the recumbent position, robs them of all restful sleep, and causes a great sense of weariness and inability to make much effort to be up or out during the day. When once begun, the natural tendency of all of this class of cases is to continue from one to three months, or until the frosts of autumn appear. You will not fail to notice that the distinguishing features of all cases belonging to this group, are their strict periodicity, their commencement in the summer, and their definite self-limited duration.

Diagnosis.—The cases belonging to all the groups I have described are distinguished from the other varieties of bronchitis by the distinct paroxysmal character of the phenomena, the apparently spasmodic quality of the dyspnœa, and the little tendency to muco-purulent expectoration or the accumulation of inflammatory products in the bronchial membrane. From pneumonia, pulmonary œdema, tuberculosis, and pleuritic effusions, they are distinguished by the predominance of dry wheezing râles, prolonged expiratory acts, and the absence of both increased vocal fremitus and dullness on percussion. From pulmonary emphysema they are distinguished by the paroxysmal character of the dyspnœa and its temporary duration, while that of emphysema is more continuous and generally permanent.

Prognosis.—None of the cases belonging to the class of affections now under consideration are liable to terminate fatally unless they become complicated with other more dangerous forms of disease. Indeed, many of the cases affected with annually recurring attacks of asthmatic bronchitis have lived beyond three score and ten years.

Treatment.—As the cases belonging to the first and second groups are pathologically similar to the milder grades of catarrhal and rheumatic bronchitis, with the addition of irritation of the muscular fibers of the smaller bronchi causing their contraction, so you will find the treatment I have already explained as applicable to those varieties equally applicable in the cases belonging to the groups named; provided, you can add some element or influence that will more directly lessen the morbid sensitiveness of the nerves controlling the action of the muscular fibers and thereby relieve their spasmodic contraction. In the limited number of cases that are

distinctly connected with the rheumatic or gouty diatheses the nervous irritation is dependent on the retention in the blood of the same morbid material that causes local irritation in other parts of the fibrous structures of the body. Consequently the most speedy and effectual relief is to be obtained by combining with the anti-rheumatic or anti-gout remedies some agents that will lessen the sensibility of the bronchial nerves, and thereby lessen the constriction. In many of the rheumatic cases I have seen very great relief obtained by simply adding to the treatment I have already advised for rheumatic bronchitis a simple dose composed of from three to five decigrams (gr. v to viii) of sulphate of quinia and fifteen milligrams (gr. ¼) of codeia, between eight and nine o'clock each evening. In cases complicated with the gouty diathesis I have found no combination more promptly beneficial than the bromide of lithium and wine of colchicum, as in the following formula:

℞	Lithii Bromidi,	20.0 grams	ʒv
	Vini Colchici Radicis,	20.0 c. c.	ʒv
	Elixer Sinplicis,	120.0 c. c.	℥iv

Mix. Of this four cubic centimeters (fl ʒi) may be given every three, four, or six hours until relief is obtained or the colchicum begins to disturb the bowels.

In a large proportion of the cases belonging to the second group, as previously described, the combination of bromide and iodide of potassium with the fluid extract of the grindelia robusta and stramonium will afford much relief. The following is a convenient formula:

℞	Potassii Bromidi,	25.0 grams	ʒvi
	Potassii Iodidi,	15.0 grams	ʒiv
	Extracti Grindeliæ Fluidi,	60.0 c. c.	℥ii
	Tincturæ Stramonii,	15.0 c. c.	ʒiv
	Elixir Simplicis,	45.0 c. c.	℥iss

Mix. Of this four cubic centimeters (fl. ʒi) may be given in a little additional water every four or six hours, until some relief is obtained, after which it may be continued three times a day until the relief is more complete. In many of these cases the addition, to this treatment, of a single powder of sulphate of quinia and codeia at night, will give much better rest, without inducing unpleasant secondary effects. In some of these cases, the formula I have already given you during the present hour, containing muriate of ammonia with small quantities of antimony and morphia, may be substituted for that containing the bromides and iodides, continuing to use the quinia three times a day, without the codeia. Some writers strongly recommend the use of morphia by hypodermic injection, either alone or in conjunction with chloral hydrate by the stomach.*

There is no doubt about the efficacy of the hypodermic injection of the sulphate of morphia, in *temporarily* relieving the paroxysms of dyspnœa; but very great caution is required in its use in all such cases. When the patient has already been laboring under the dyspnœa several hours and the blood is consequently impregnated with an excess of the retained carbonic acid gas, the quick development of the narcotic influence of an ordinary hypodermic injection of the sulphate of morphia, not

* See Practice of Medicine, by Bartholow, p 420.

only affords prompt relief to the dyspnœa, and induces sleep, but co-operating with the depressing qualities of the retained carbonic acid gas, there is great danger of so far paralyzing the respiratory function that death will follow in a few hours. Two such cases have come to my knowledge in this city, during the past year. Both were supposed to be laboring under simple severe paroxysms of catarrhal asthma, to which they had been subject, when the attending physician gave not more than fifteen milligrams (gr. $\frac{1}{4}$) of morphia hypodermically. In each case the breathing soon became easier and sleep followed. In a little while the patients began to breathe more heavily, and to make no response to efforts to arouse them, and died in from six to eight hours.

I have known similar results to follow in some cases of delirium tremens, in which liberal doses of chloral hydrate had been given, until the system was well supplied with it, and yet not controlling the nervous agitation and morbid vigilance, a hypodermic injection of morphia was resorted to by the attending physician, with the effect of speedily inducing a sleep from which there was no awaking. It is my duty to caution you, therefore, against resorting to hypodermic injections of morphia or other active opiate preparations when the blood is already imperfectly decarbonized from existing dyspnœa, or impregnated with previous liberal doses of other narcotics or anæsthetics, lest the sudden development of the additional effect of your hypodermic should carry the suspension of nerve sensibility one step too far, and fatally paralyze the respiratory movements.

In the treatment of the third group of cases, or those popularly called hay-asthma or hay-fever, a great variety of remedies have been tried with but little apparent benefit. In some cases that have come under my observation during the last few years the usual annual attack has been prevented, and in others rendered very mild, by commencing the use of quinine two weeks before the time for the expected attack, giving from two to three decigrams (gr. iii to v) morning and evening during the first week, and the same doses three times a day during the second and third weeks, or until one full week after the time the attack had usually commenced. At the same time with the use of the quinine internally, the patients have been required to inhale through the nostrils three or four times a day, the vapor of the oil of eucalyptus globulus from a small vial which they could carry in their pockets. The number of cases thus treated for the purpose of preventing an attack is not large enough to test the real value of the plan; but so far as it has been faithfully tried it has proved positively beneficial. Of course, in all these cases, due attention was given to the regularity of the digestive organs and the excretory functions of the skin and kidneys. After the patient has passed one week beyond the regular time for the attack to commence, without its recurrence the use of the quinine may be diminished to thirteen centigrams (gr. ii), morning and evening, and one week later to only one dose every morning. But the inhalation of the vapor of the eucalyptus should be continued two or three times a day until the season for the active prevalence of the disease is passed. Instead of inhaling the vapor of the eucalyptus oil, others have used with supposed benefit free washing of the nostril with a solution of sulphate of quinia, every morning and evening, for the purpose of destroying the *germs* which are supposed to impinge on the Schneiderian membrane and to be the active agents in producing the disease.

On the same theory of causation, one man is reported to have prevented the return of his usual attacks by constantly wearing a gauze veil over his mouth and nostrils. When preventive treatment has been neglected

or has proved unsuccessful, and an attack has already commenced, I have seen much relief obtained by the use of a mixture of the fluid extracts of the grindelia robusta, the eucalyptus globulus, and tincture of stramonium, with bromide of potassium as in the following formula:

℞			
	Potassii Bromidi,	25.0 grams	ʒvi
	Extracti Grindeliæ Robustæ Fluidi,	60.0 c. c.	ʒii
	Extracti Eucalypti Globuli Fluidi,	60.0 c. c.	ʒii
	Tincturæ Stramonii,	15.0 c. c.	ʒiv

Mix. Four cubic centimeters (fl. ʒi) of this mixture may be given every four or six hours, in a little sweetened water; and in addition from two to three decigrams (gr. iii to v) of sulphate of quinia each morning and evening. When much dyspnœa has supervened, fifteen milligrams (gr. ¼) of codeia or morphia may be added to the evening dose of the quinine. In the early stage, while the membrane lining the nostrils is congested, presenting the ordinary symptoms of coryza, the nostrils should be rinsed every morning with a solution, either of quinine, carbolic acid, or benzoate of sodium, and the vapor of the oil of eucalyptus inhaled frequently during the day. In many cases, the patients obtain much temporary relief from smoking pastiles or cigarettes made of stramonium leaves previously soaked in a solution of nitrate of potassium. When, as sometimes happens in the night, the paroxysms of dyspnœa become very distressing, and the means already mentioned fail to afford relief, the temporary and cautious inhalation of either ether, chloroform, or nitrite of amyl may be resorted to. In some of this class of cases you will find a degree of soreness in the chest and feverishness indicating a more decided inflammatory action in the bronchial membrane. In such, the formula I have given you containing muriate of ammonia (see page 406) should be given in place of that containing the grindelia robusta, or from six to ten decigrams (gr. x to xv) of iodide of potassium may be given dissolved in the syrup of glycyrrhiza three times a day. Many other remedies have been tried and recommended by different parties in the treatment of this disease, but they all generally fail to do more than palliate the more distressing symptoms until the season for the continuance of the disease has passed when it ceases spontaneously, leaving the patient much impaired in strength, both of body and mind; but from which he recovers in a few weeks, with the assistance of plain food, pure air and moderate exercise.

Prophylaxis.—From the fact, developed by common observation and confirmed by the investigations of Dr. Morrell Wyman and others, that this variety of disease prevails only in certain districts of country and at seasons of the year when vegetation is well developed, and does not prevail in other locations, it has generally been supposed to originate from the inhalation of fungi, or the pollen of flowering grasses floating in the air. But whether the disease is caused by these, or by the organic germs discovered by Helmholtz, or by neither, the important fact remains, that large districts of country are entirely exempt from the prevalence of the disease. And consequently the most certain of all the prophylactic measures is for the susceptible parties to resort to some one of these localities during the season of the liability to an attack, or still better to make such locality their permanent place of residence. In our country the places of non-prevalence of this disease embrace the mountain districts of New Hampshire, Vermont and New York, continuing with the Allegheny range southward to its termination in the Southern States; also the island of Mackinaw, Marquette, and all the territory around Lake Superior; to-

gether with the great mountain ranges stretching from Dakota to the table lands of Western Texas, and the western or Pacific slope of the Sierra Nevadas. In almost any part of these elevated regions and in some more limited districts not elevated, the sufferer from bronchial asthma or hay-fever may obtain entire exemption, either by a temporary resort during the season of his liability to an attack or by a permanent residence.

LECTURE XLIII.

Pneumonia—Its History, Causes, Symptoms, Pathological Anatomy, Diagnosis and Prognosis.

GENTLEMEN: The disease to which I invite your attention during the present hour, is one of the most important inflammatory affections that you will meet in your ordinary fields of general practice. By pneumonia is meant an inflammation of the parenchyma of the lung. Descriptions of the disease, more or less accurate, are to be found in the earliest records of medical literature, although it was not clearly differentiated from bronchitis and pleurisy until the beginning of the present century. By many of the early writers it was called peri-pneumonia, by others malignant pleurisy, bilious pleurisy, and when complicated with capillary bronchitis, peri-pneumonia notha. By Dr. Gallup, in his history of the epidemics of Vermont from 1800 to 1815, and by other early New-England writers, the disease is often called malignant pleurisy, peri-pneumonia, and pneumonia typhoides. From these writers it would appear that the disease was not only of frequent occurrence in the latter part of winter and early spring, but in some localities assumed a very malignant and fatal character. At the present time it is generally called pneumonia, pneumonitis, or pneumonic fever. By most writers two varieties are recognized, namely, the croupous and the catarrhal. The first name is used to designate such cases as attack the parenchyma of the lung primarily, and the second, such as are complicated with or are secondary to the symptoms of bronchitis. When the inflammation attacks a section of the lung it is called *lobar* pneumonia; when it invades separate lobules, either primarily or by extension from the smaller bronchi, it is called *lobular* or disseminated pneumonia; and if the latter continues in a chronic form it is generally called *interstitial* pneumonia and sometimes fibroid phthisis or pulmonary sclerosis. When it has prevailed in malarious districts, and the accompanying fever has shown distinct exacerbations and remissions it has been styled *bilious* pneumonia or *lung fever*.

Etiology.—The prevalence of pneumonia is influenced by climate, season of the year, occupation and habits, age, sex, and previous condition of health. The statistics presented by Dr. Samuel Forrey in his work on the climate of the United States, to which I have referred in previous lectures, appeared to show that pneumonia was most prevalent, and caused the highest ratio of mortality, in what he called the middle climatic belt, which embraces that part of our country lying between the thirty-third and the

thirty-ninth parallels of latitude, and extending from the Atlantic coast to the eastern slope of the Rocky Mountains. It is in that belt of country that you find long continued and high summer heat, and though the winters are short they usually embrace one or more periods of intense cold, which gives the thermometric combination of long and warm summers, short and cold winters, and a wide range between the warmest days of summer and the coldest days of winter. Other circumstances being equal it was where these characteristics were most marked that he found attacks of pneumonia to occur numerically most frequent and to prove most fatal. It must be remembered, however, that the statistics compiled by Dr. Forrey, and to some extent re-produced by Dr. Drake in his work on the topography and diseases of the Interior Valley of the Continent, relate exclusively to adult males, as represented by soldiers and officers in the United States army. And while this makes the conditions for comparison in some respects more uniform, yet the liability of soldiers to be frequently changed from one place to another, and the absence of both children and old persons, may cause the result to be somewhat different from what it would be if the comparison could be based on equally correct statistics of the sickness and mortality in a resident population of all ages and both sexes. The statements made by standard writers in regard to the effects of climate on the prevalence and mortality of pneumonia are very general and in some respects contradictory. Thus one of the latest writers on practical medicine says: "Its prevalence is extensive over the globe, and it is found nearly alike in all latitudes." * Another simply remarks that "it occurs in all degrees of latitude, under every variety of climate, and at all ages." †

These expressions would lead you to suppose that climate exerted little or no influence over the prevalence of the disease. On the other hand, Drs. Drake and Flint represent the disease as much more prevalent and fatal in the Middle and Southern States than in the Northern. The latter says: "In this country the disease occurs in the Middle and Southern much oftener than in the Northern States." ‡ You will be able to judge better of the value of these general statements, and also concerning the differences between statistics exclusively from military posts compared with those from large cities with their mixed and dense populations, by the following figures relative to the ratio of mortality from pneumonia in the cities of Chicago, New Orleans and San Francisco for the year 1882, derived from the official reports of the health officers of the cities named: The whole number of deaths from pneumonia in Chicago in 1882, as reported from the health office, was 782; that is, 1 for every 645 of the entire population, as given in the census of 1880. The whole number reported in New Orleans for the same year was only 203, or *one* for every 1088, of the population as given by the same census. The whole number of deaths from pneumonia reported in San Francisco, during 1882, was 452, which makes one death to every 518 of the population. Lest there should have been some extraordinary or unusual prevalence of the disease in Chicago in 1882, I extended my examination of the records to three consecutive years, and found the average ratio of deaths from pneumonia for the years 1880–1–2, to have been one in 765 of the whole population. You thus see that the actual mortuary statistics show a very decidedly greater prevalence of pneumonia in this city, representing the

* See Science and Practice of Medicine, Vol. II., p. 204, 1882, by A. B. Palmer, M. D., etc.
† See Practice of Medicine, p. 325, 1881. By Roberts Bartholow, M. D.
‡ See Practice of Medicine, p. 168, 1881. By Austin Flint, M. D.

northern part of the great interior valley of our country than in New Orleans, which represents the southern part of the same valley. Without taking time to work out the details, I have extended the examination far enough to show that the same results would appear if the comparison should be extended to the cities of Buffalo, New York and Boston, in contrast with Mobile, Jacksonville and Charleston, as representing the north-eastern and south-eastern parts of our country.

A similar examination of such official returns as are within my reach concerning the mortality from pneumonia in the cities of Washington, Cincinnati and St. Louis, representing the middle belt or zone, as described by Dr. Forrey, appears to show a slightly larger ratio of deaths in proportion to the population than the cities of the northern belt. The difference, however, is not great. From such fragmentary facts as I have been able to gather from reports on epidemics and on the prevalence of acute diseases, made to the American Medical Association and to several of the State medical societies, I think the same relative ratio of mortality from pneumonia exists in the country districts of the Northern, Middle and Southern belts as in the cities I have named. While it is true, therefore, that pneumonia prevails to some extent over a large part of the inhabited portions of the globe, it is nevertheless influenced very much by climate; being more prevalent and causing a higher ratio of mortality in the middle and northern parts of the United States than in the southern. The same rule applies to the Pacific slope, embracing the States of California and Oregon, which are represented by some writers as enjoying a singular immunity from the disease;* while the statistics of mortality in San Francisco for 1882, as I have already stated to you, show a higher ratio of mortality from it, than either Chicago or New Orleans. The fact that pneumonia is more prevalent in cold than warm climates is corroborated by the influence of season of the year.

Seasons.—Of the 782 deaths from pneumonia in Chicago in 1882, 295 occurred during the first quarter, 246 during the second, 85 during the third and 158 during the fourth. Of the 203 deaths reported in New Orleans for the same year, 86 occurred during the first quarter, 58 during the second, 35 the third and 24 the fourth. In San Francisco for the same year, of 452 deaths from this disease, 225 occurred during the first quarter, 108 the second, 44 the third and 75 the fourth.

From these figures it appears that about two-thirds of all the deaths occur during the first six months of the year, and that the causes of the disease reach their highest degree of activity about the middle or climax of the winter season, and continue active until the beginning of summer. From a table giving the number and causes of deaths in the city of Memphis in 1852, I learn that the number of deaths from pneumonia was 26. The population was then estimated to be 12,000, which would be 1 in 461 of the population. Of the 26 cases 12 occurred during the first quarter, 4 the second, *none the third*, and 10 the fourth.†

The statistics derived from the various military posts give the highest ratio of attacks during the first quarter, while in some places the next highest was in the second and others in the fourth; but all agree in giving the lowest ratio of both cases and deaths in the third quarter, composed of July, August and September. Throughout the countries of Europe the same influence of the seasons is observable as in this country.‡

Occupation and Habits.—Pneumonia is undoubtedly more frequently

* See Reynolds' System of Medicine, American edition, Vol. II, p. 154.
† See Transactions of the American Medical Association, Vol. VI, p. 326, 1853.
‡ See Reynold's System of Medicine, American edition, Vol. II, p 155.

met with among those classes whose occupations cause them to be most exposed to the vicissitudes of the seasons, and are scantily supplied with the means of protection. In the Southern States the colored population suffer in a greater ratio than the white, especially in the plantation districts. The same is true concerning the Mongolians in San Francisco, and the poorer laboring classes of the foreign population in all the Northern cities. Personal habits also exert an important influence. Living and sleeping in overcrowded apartments; wearing insufficient clothing to protect the surface from sudden and severe atmospheric changes; and more than all, the free use of alcoholic drinks. The latter act directly by impairing the vasomotor nerve influence and lessening the efficiency of the processes of disintegration and elimination, and indirectly, by leading those under their excessive influence into severe exposures, while the power of vital resistance is impaired.

Age.—You will find cases of pneumonia occurring at all periods of life. But as might be inferred from what I have just said about the influence of occupations and habits, it occurs more frequently in the middle period of adult life, that is, from twenty to forty years of age than either earlier or later in life. The next periods most liable to attacks are those of infancy, or under five years and over sixty.

Sex.—The same circumstances that determine the attacks to occur more frequently among the most exposed part of the adult population, also operate to render the attacks more frequent in men than in women, in the ratio of two or three to one. This applies, however, chiefly to the cases occurring during the active period of adult life; the excess among males being much less in early childhood than at the subsequent periods.

Previous Condition of Health.—You will see it stated by some writers that pneumonia attacks the vigorous and healthy more frequently than the infirm. This opinion has doubtless arisen from the fact that it is chiefly the vigorous and healthy who engage in such occupations as subject them to the exposures and hardships most likely to induce attacks, while the weaker and more delicate seek less severe work and better protection. If both classes were subjected to the same degree of labor and exposures, there is no doubt but the weaker would give a much higher ratio of attacks than the more robust. And yet, with the exception of pulmonary tuberculosis, I have not been able to see any special predisposition to attacks of pneumonia during the progress of other diseases or constitutional cachexies. That the presence of primary tubercular deposits greatly favors the development of pneumonic inflammation in the tissues surrounding such deposits, I have no doubt.

Exciting Causes.—Many cases of pneumonia occur without any apparent exciting causes. Many other cases are traceable to exposure to cold currents of air upon limited parts of the surface, or to such protracted severe cold as to chill the whole body and depress the vasomotor influence over the systemic circulation. Severe exercise in the face of strong cold winds is very liable to provoke an attack. In advanced life, after the cartilages of the ribs have become bony and the frame work of the chest less movable, all severe physical exercise is more liable to be followed by pneumonic inflammation. Some fatal cases have occurred in such persons under my own observation, directly induced by unusual running to reach a railroad depot before an expected train should pass. There is no tangible evidence that pneumonia is caused by any specific materies morbi, whether organic or inorganic. On the contrary, its occurrence, to some extent, in all civilized countries and at all seasons of the year, yet being markedly influenced in the degree of its prevalence

by both climate and season, its frequent association with pleurisy on the one side and bronchitis on the other, its constant variations in the amount of lung tissue involved, being in a large majority of cases unilateral, and in most of them confined to one or two lobes, and its entire exemption from the law that one attack destroys the susceptibility to subsequent attacks, render the question of its dependence on any one specific exciting cause highly improbable, and give it much more fully the characteristic of an acute local inflammation, than of a general febrile disease.

Symptoms.—The symptoms and progress of pneumonia vary in some degree from the varying circumstances under which it occurs. In most cases of acute lobar pneumonia the attack commences with a chill or chilliness simultaneously with a dull or deep seated pain in one side of the chest, and sense of oppression or difficulty in breathing. The coldness soon gives place to increased heat; redness of the face; shorter and quicker breathing; increased pain or sense of oppression in the chest, with some cough. The pulse becomes more full and frequent; the urine less in quantity but containing an excess of urea and a deficiency of the chlorides; and bowels quiet. In many cases there is pain in the forehead increased by the jar of coughing, and aching pains in the back and limbs. At first the cough is moderate with little or no expectoration; but it increases in depth and frequency and during the second day there is more or less expectoration of a thick mucus, which increases during the third and fourth days and usually becomes intimately intermixed with blood, constituting the "rusty spu a" mentioned in all your works on practice, as characteristic of pneumonic inflammation. All the general febrile symptoms, together with the local pain and oppression in the chest, continue to increase until the climax is reached, usually between the beginning of the fourth and the end of the sixth days. At that time you will generally find the face still somewhat flushed, expression dull, mind often wandering, especially during the night, respirations short with diminished expansion of one or both sides of the chest, pulse frequent, soft, and in some cases decidedly weak, cough frequent with pretty free bloody expectoration, and a temperature between 39.5° and 41.6° C. (103° and 106° F.). If the inflammation has involved the whole of one lung or a large part of both, the diminished oxygenation and decarbonization of the blood may cause the flush on the face to appear purplish or leaden in color, the mind to be more dull and drowsy, some coarse mucous râles in the chest, with very imperfect expansion, and a weak, variable pulse. In cases progressing unfavorably the drowsiness and mental wandering increase, the expectoration shows less blood and more intermixture of pus, the breathing becomes more oppressed, with increasing difficulty in clearing the bronchial tubes of the constantly accumulating muco-purulent exudation, the cardiac impulse and the whole circulation diminish rapidly in force, and finally the surface becomes covered with a clammy sweat, the discharges become involuntary, the larynx and trachea move up and down at every inspiration and expiration, the chin soon drops, the breathing becomes very frequent and noisy, and life ceases, more frequently between the sixth and ninth days from the beginning of the attack. In cases progressing more favorably, after reaching the climax of both general and local symptoms between the third and fifth days all the more prominent symptoms remain nearly stationary one or two days, after which the temperature rapidly declines, the expectoration contains less blood, changing first to a tawny or reddish yellow, and subsequently to an opaque or muco-purulent appearance and easily dislodged by coughing, the soreness and

oppression rapidly diminish, the pulse becomes slower and more natural, and the secretions more free. These changes take place so rapidly that, in the milder cases, convalescence is established in from seven to nine days from the initial chill, while in the more severe the same result is not reached in less than from eleven to fourteen days. Thus far in the clinical history of the disease I have directed your attention to such symptoms as you may observe without special physical exploration, but the additional knowledge to be obtained concerning the existence, extent, and stage of progress of pneumonia, by proper auscultation and percussion, is of such importance that these methods of investigation should never be neglected. Immediately after the initial chill and during the first stage of the inflammatory process, auscultation over the affected part of the chest readily detects a fine, dry, crepitant râle, rather suddenly and sharply developed in the last part of the act of inspiration and ceasing with the beginning of the expiratory act. At the same time and place there is slightly increased fremitus of voice and a shade less than the natural resonance on percussion. In from twenty-four to forty-eight hours in most cases the fine crepitant râle begins to diminish, giving place to a sub-mucous or moist râle with still more vocal fremitus and more decided dullness on percussion. These physical signs continue rather to increase until the climax of the disease, between the fourth and seventh days, accompanied by an increasing amount of coarse, mucous ronchus. If the case progresses unfavorably the same dullness on percussion, increased vocal fremitus, and coarse mucous ronchus continue until the fatal result. But if the tendency is to recovery, in one or two days after reaching the climax the dullness and vocal fremitus begin to diminish, and finally disappear with the establishment of convalescence. You perceive that the fine crepitant râle is coincident with the stage of simple engorgement of the pulmonary capillaries and consequent pressure upon the alveoli or air cells, and that it disappears as the exudation progresses, filling up the alveoli and interstitial spaces instead of simply compressing them, while the vocal fremitus and dullness from percussion, only slight during the stage of engorgement, become decided and well marked as characteristic of the stage of exudation and solidification, and gradually disappear during the stage of resolution. In some cases the crepitant râle reappears for a brief time at a certain stage of the process of resolution, and is then called "crepitus redux." By carefully noting these physical signs from day to day, in connection with the ordinary symptoms, you will be able to attain a very accurate knowledge both of the extent and stage of progress of the inflammation in any given case.

Malarial Influences.—Having detailed to you the more important symptoms and physical signs of the ordinary typical cases of acute lobar pneumonia, I must remind you of certain important deviations from this standard, that you are liable to meet with more or less frequently. For instance, in strongly malarious districts there are many members of the community who have, habitually, less than the normal quantity of red corpuscles and plastic elements in their blood, and the vital affinity or tonicity of whose tissues is below the standard of good health. It is well known that in all such communities pneumonia is apt to prevail more or less during the last half of winter and the early part of spring. Cases occurring under such circumstances are more uniformly ushered in by a decided chill, followed by a more rapid development of a high grade of fever, with more acute pain and sense of oppression in the chest, more frontal headache, and early crepitant râle over a larger part of one lung. But the state of the blood and the properties of the tissues are both favor-

able to early and copious exudation. Consequently the decided dullness on percussion comes earlier with more copiously bloody expectoration and more oppressed breathing. In most of these cases the fever distinctly remits in the morning and exacerbates in the afternoon and first half of the night; and as it approaches its climax there is more delirium and a greater degree of exhaustion. A large proportion of these cases tending to recovery, terminate the general symptoms rather abruptly by critical evacuations from the skin, kidneys or bowels; after which the affected part of the lung clears up by resolution with remarkable rapidity. On the contrary, in cases progressing toward a fatal result, after reaching the climax of the exudative stage, the skin and eyes, in many, present a yellow or jaundiced hue; the urine scanty and of a reddish yellow color; pulse frequent, but soft and weak; mind dull or wandering; respirations short, with sudden fall of the abdominal muscles in expiration; cough frequent, and accompanied by copious reddish yellow expectoration consisting of muco-purulent material mixed with the red corpuscles, and indicating the existence of a diffuse suppurative process in the inflamed part of the lungs. Most of the cases presenting such symptoms, reach a fatal degree of exhaustion and the patients die during the second week of their progress. During the first ten years of my residence in this city (Chicago), while there was neither proper sewerage nor an adequate supply of water from the lake, and malarious or periodical fevers were prevalent in some degree during every summer and autumn, I saw many cases of pneumonia during the winter and spring seasons presenting all the modifications in symptoms and progress I have indicated.

Typhoidal Influences.—In the more densely populated cities, manufacturing towns, and long-settled country districts, where the sanitary conditions exist which predispose to the development of typhoid fever, diphtheria, etc., the attacks of pneumonia are characterized, generally, by a less marked chill at the commencement, less acute pain in the chest, a slow rise of temperature, a softer, weaker pulse, and a more dull, heavy expression of countenance. The first or congestive stage is usually short, exudation commencing early but progressing more slowly than in cases influenced by malaria, and generally giving rise to less blood in the expectoration, but of a darker color; and when the crisis is passed, the process of re-absorption and removal of the exudative material goes on slower and sometimes less perfectly. In cases which are progressing unfavorably, about the end of the first week the pulse becomes more frequent and weak; respirations short and abdominal; the tongue and mouth dry; the mind dull and sometimes delirious; cough, and expectoration moderate in amount, but the latter dark or reddish brown color and consisting of muco-purulent matter mixed with dark blood; the intestinal evacuations thin and brown but not frequent, and usually by the middle or latter part of the second week, the efforts at coughing do not clear the bronchial tubes of the accumulating sputa; the coarse, moist râles increase over the whole chest, the lips and countenance show a leaden paleness, the pulse sinks to a mere thread, skin becomes wet with a cool sweat, and the patient dies. A large proportion of the cases of pneumonia which have occurred in this city during the last twenty years, have been of this grade.

Rheumatic Pneumonia.—When speaking of bronchitis in a former lecture, I stated that rheumatic inflammation was liable to occur in the fibrous structure of the smaller bronchi, and sometimes to extend into the connective tissue of the lungs in a chronic form, and cause pulmonary sclerosis. I have also met with occasional cases of more acute rheumatic

inflammation primarily attacking the pulmonary structures, and constituting a dangerous and persistent form of pneumonia. I have seen one such case in consultation during the present winter. A man aged fifty years had been attacked two weeks previous to my visit with severe pain in the lower part of the right side of the chest, accompanied by some cough, shortness of breath, and general fever, with a fair degree of the fine crepitant râle and slight dullness on percussion. On the second day the crepitant râle had ceased over the lower part of the right lung, giving place to a slight amount of sub-mucous râle and decided dullness on percussion, but the expectoration was scanty, tenacious and only tinged with blood. At the same time there was a line higher up over which the fine crepitant râle was very distinct, indicating an extension of the inflammation upward. The same progress upward continued until the whole of that lung had been invaded and rendered dense from the exudation, giving all the physical signs of hepatization, and a temperature varying from 39° to 40.5° C. (103° to 105° F.). The inflammation then attacked the lower lobe of the left lung, and at the time of my visit was occupying more than half of that lung; the night previous the patient had been attacked with severe pain in the cardiac region, with great sense of oppression in the whole chest, while the pulse was rapid, irregular, and weak. I found in addition to the physical signs of hepatization over the whole of the right and more than half of the left side of the chest, plain endocardial murmurs indicating active inflammation in the lining of the left cavities of the heart. The extremities were cool and purplish; the pulse frequent, irregular and soft; respirations short with moist râles and but little expansion of the chest; and mind wandering. He died about twenty-four hours later. No post mortem examination was allowed. Throughout the whole course of the disease, the expectoration had been tenacious mucus without pus, and only scantily mixed with blood; and the pain in the chest had been unusually severe and persistent. These facts, with the final development of endocarditis, and the further fact that the patient had been subject to occasional attacks of articular rheumatism for several years, left no doubt on my mind but that the present attack was one of subacute rheumatic inflammation of the parenchyma of the lungs. In other words a genuine rheumatic pneumonia.

Catarrhal Pneumonia—Lobular, or Disseminated Pneumonia.—Lobular catarrhal pneumonia, as described by most writers, is a secondary affection, occurring in connection with capillary bronchitis, and is met with far more frequently in early childhood and in old age than at any of the intermediate periods of life. As the pneumonic inflammation in these cases results from either a direct extension of the inflammatory action from the bronchioles to the alveoli of the lung, or from a prior occlusion of the bronchi and collapse of the alveoli or clusters of cells, (atelectasis) involving capillary congestion and inflammation, it necessarily develops in the individual lobules, and not in a section of the lung as in lobar pneumonia. And as individual lobules may be involved leaving other lobules between them unaffected, such cases have given rise to the phrase "disseminated pneumonia." So far as the inflamed lobules are concerned they pass through the same stages of congestion, exudation, hepatization, and resolution or suppuration, as occur in lobar inflammation. The co-existence of capillary bronchitis in almost all of the cases of the lobular form of pneumonia, is well calculated to obscure some of the more important diagnostic symptoms of the latter. For instance, the mixture of dry and moist râles generally heard so readily over the greater part of the chest in capillary bronchitis, is so much more prominent than

the fine crepitant râle of the pneumonia that the latter is seldom distinguished; while the separation of the affected lobules by the intervention of others not affected, causes the dullness on percussion and fremitus of voice to be less marked than in the second stage of ordinary lobar pneumonia. And if the number of lobules involved is small, the pneumonic part of the disease may escape detection. Usually, however, the increased fremitus and diminished resonance, coupled with the diminished expansion of the chest, shortness of the expiratory act, and the higher temperature, are sufficient to indicate the existence of the pneumonic complication, even if no rusty sputa are seen.

Pathological Anatomy.—The very vascular and distensile character of the lung structure allows the ordinary anatomical changes which take place in the different stages of all inflamed tissues, to reach a high degree of development. The intense vascular engorgement of the first stage gives to the inflamed portion of lung a bright red color, with less crepitation between the fingers and less complete collapse. In the second stage, that of exudation and solidification, the redness is a shade darker, the crepitation between the fingers and the tendency to collapse entirely lost, and the cut surface presents a red, granular appearance from which oozes a scanty amount of red frothy serum, mixed with blood from the larger severed vessels. Examined under the microscope the capillary vessels surrounding the alveoli are seen greatly distended and in many places obstructed by the corpuscular elements of the blood; while the alveoli and interstitial spaces of the connective tissue are filled with leucocytes or migrating corpuscles, liquor sanguinis, and more or less solidified fibrin and plastic elements of the blood. If death takes place during the third stage the inflamed portion of lung is less intensely red, a little less firm or hard to the feel, but still without crepitation or collapse under pressure. When incised the cut surface presents a lighter grayish color, less granular, and from it oozes a somewhat frothy sero-purulent fluid, with blood from the orifices of the severed blood-vessels. Examined more closely the cut surface in most cases is found to contain many small concavities or minute abscesses which have been laid open by the incision; while the miscroscope shows the alveoli and interstitial spaces still filled with inflammatory products but everywhere undergoing the process of purulent degeneration by which the leucocytes and proliferating cell elements have assumed the form of pus corpuscles. In some of the more highly plastic or phlegmonous grades of pneumonia the suppurative degeneration will be found confined to the more central part of the inflamed structure, and the pus will have collected into one or more larger and more circumscribed abscesses. And in cases of still less frequent occurrence the vessels in a portion of the lung tissue have been so completely obstructed by the accumulated inflammatory products, as to suspend all circulation in that part, and the post mortem examination reveals the existence of gangrene or death of the part, with diffuse suppuration surrounding the slough.

Diagnosis.—In giving you the clinical history of the different grades and stages of pneumonic inflammation, I have pointed out so fully the ordinary symptoms and physical signs that characterize or serve to distinguish, not only the disease itself, but also each stage of its progress, that it would be an unnecessary repetition to enumerate them again at this time.

Prognosis.—The majority of recent writers represent lobar pneumonia, or pneumonitis, as a self-limited disease, of comparatively brief duration, and in much the larger number of cases ending in resolution or spon-

taneous recovery. And these circumstances are claimed as evidence that the disease is a general zymotic fever instead of a mere local inflammation. Such writers do not appear to have comprehended the fact that all acute local inflammations are necessarily self-limited in their duration; and that they pass through certain stages either to resolution and recovery or to destruction of the inflamed structures with more uniformity than any one of the general fevers. The special prognosis in all cases of pneumonia will be influenced by the age of the patient, his previous constitutional condition and tendencies, the extent of lung tissue involved, the special character of the inflammatory process, and the diseases with which it may be complicated. All other circumstances being the same, a much higher ratio of deaths will occur in children under five years, and in adults over fifty, than at any intermediate periods of life. This is probably owing to the fact that at the two extremes of life there is less vital resistance to the progress of any acute disease, and that a very large proportion of the cases occurring at these periods are complicated with general capillary bronchitis. When the disease attacks persons of a distinctly scrofulous or tuberculous diathesis there is a much greater tendency to early and diffuse purulent degeneration of the exudative material and consequently to a higher ratio of deaths. The same remark applies also to such cases as occur in subjects affected with constitutional syphilis. No one circumstance, however, exerts more influence over the rate of mortality than the *extent* of lung tissue involved in the inflammation. Inasmuch as the oxygenation and decarbonization of the blood (changes essential to the continuance of life) are directly dependent on the continuance of the supply of fresh air in the pulmonary alveoli and the proper movement of the blood around such alveoli, it is evident that whenever the products of pneumonic exudation occupy the alveoli, infundibuli and interstitial spaces of so large a part of the lung structure as to interrupt or greatly diminish the amount of these changes, the life of the patient will be lost or placed in great danger. But so long as the inflammation does not occupy decidedly more than one half of one lung, or only one lobe of each lung, there will be but little danger from the direct interference with the oxygenation and decarbonization of the blood; and if there are no complications with other diseases or unfavorable constitutional conditions, such cases will pretty uniformly recover under favorable hygienic management alone. In cases of double pneumonia in which more than half of each lung is involved and filled up with the inflammatory products, death usually results from apnœa before the third stage of the inflammatory process is reached. When the disease is unilateral, though involving the whole lung, or double, and involving only a little less than one half of each, the patients will not usually die directly from apnœa or the exclusion of air; and yet the interchange of the carbonic acid gas for oxygen as the blood passes through the pulmonary vessels will be so much diminished that the blood passes into the left cavities of the heart and is sent through the whole arterial system in a condition which renders it incapable of maintaining the full activity of the nervous and secretory structures generally. Consequently the patient's mind becomes dull or wandering; his countenance dingy; his pulse frequent and soft or weak; cardiac impulse diminished; moist râles increase in the chest; the surface relaxes and the skin becomes covered with perspiration; and a little later the sphincters relax, allowing involuntary discharges and death. The latter takes place, in most of these cases, during the second week after the commencement of the attack, and is very generally attributed to asthenia or cardiac weakness. But what

causes the asthenia? Plainly, just two factors. First, the imperfect oxygenation and decarbonization of the blood, as just described; and second, the diversion of three or four pounds of blood from the general circulation and its lodgment as exudative material in the alveoli, infundibuli, bronchioles, and interstitial spaces of the connective tissue of the inflamed part of the lungs, constituting a form of depletion very much more dangerous to the patient than the loss of one or two pounds by venesection to relieve the vascular engorgement of the first stage of the morbid process.

Another circumstance which exerts an influence on the prognosis is the special character of the inflammation as determined by the nature of the predisposing causes and sanitary surroundings of the patient. You may regard it as a general rule, that the presence of all such causes as favor the development of a typhoid or asthenic condition; or of the active prevalence of the malaria that causes periodical fevers; or of any special epidemic influence, will increase the ratio of mortality from pneumonic inflammation. The same is true in regard to such cases of pneumonia as occur in individuals already laboring under any one of the general febrile affections, or any serious disease of the heart or kidneys. Pneumonia is not a very infrequent complication of such cases of typhoid, malarious and eruptive fevers as occur during the cold and changeable seasons of the year. Measles and whooping-cough are particularly liable to become complicated with the pulmonary inflammation. And in all such cases, as well as in those that occur in connection with organic diseases of the heart, there is greater danger of a fatal termination than from an equal extent of pneumonic inflammation without the co-existence of other diseases.

From the foregoing observations you will readily infer that the statistics given by different writers concerning the ratio of mortality from pneumonia are of very little value unless accompanied by the facts concerning the various modifying influences to which I have referred.

LECTURE XLIV.

Pneumonia Continued—Its Treatment. Chronic Pneumonia—Its Symptoms, Pathological Anatomy, Diagnosis and Treatment.

GENTLEMEN: You will find in the text books and literature of the profession many and widely differing methods of treatment for pneumonia at different times, and by different writers at the same time. You will find among these, the method by blood-letting, by antimonials, by mercurials, by expectation, by alcoholics, by sulphate of quinia, by cold affusion or the pack, and by nothing except rest and nourishment. You will see each of these methods discussed, not in regard to their applicability to particular cases and stages of the disease, but in comparison with all the other methods, as special modes of treatment applicable to all cases alike. And as nearly all the cases of uncomplicated unilateral pneumonia tend to recovery the advocates of each method make a fair show

of success. And when one like M. Barthez, in his paper presented to the French Academy of Medicine in 1862, on the expectant treatment of pneumonia in children, skillfully eliminates from his statistics all lobular, pseudo-lobar, catarrhal, and broncho-pneumonic cases, together with such as occur in the progress of other diseases, it is not surprising that he should report the extraordinary ratio of only one death in 106 cases.* By such a course nearly all the cases involving any danger to life are set aside, and of course those remaining to be reported on, ought to recover under any treatment not positively detrimental. If the statements I made to you in the thirty-third lecture of the present course, concerning the fixed and variable elements of the inflammatory process, and the modifications the latter are capable of inducing are correct, as well as the views presented in the lecture of yesterday concerning the modifying influence of different causes on the character and results of pneumonia, you can not fail to recognize the inutility of attempting to treat all cases of the disease by any one method or by the same remedial agents in the different stages of its progress. On the contrary, the special objects to be accomplished or indications to be fulfilled in the treatment of pneumonia, vary with each successive stage in the progress of the inflammation. In the first stage, characte ized by increased excitability of texture and intense engorgement and distension of vessels, the plain indications are to allay the excitability and lessen the vascular fullness; and in the same ratio that you succeed in fulfilling these will you lessen the amount of exudation and hepatization which are to constitute the second stage of the disease.

When the latter has already supervened, however, then your leading objects must be to hasten the disintegration and promote the removal of the exudative material, thereby inducing resolution before suppuration or caseous degeneration should take place. But if the latter processes do make a fair beginning, constituting the third stage, or that usually called gray hepatization, your main objects must be to limit the degenerative processes and sustain the nutrition and strength of the patient. Such are the rational indications for treatment founded on the important pathological conditions present in each successive stage of the disease; but the particular means most efficient for accomplishing the several objects named, as well as the time and manner of their use, will be materially influenced by certain coincident conditions relating chiefly to the quality of the blood and the general tonicity of the tissues. For instance, if a patient when attacked with pneumonia has good blood, of natural degree of plasticity, and an active vital affinity giving to his tissues a good degree of tonicity, his case will present all the characteristic symptoms of an active or sthenic grade of inflammation. On the other hand, if the patient when attacked had already been exposed to malarial influences until his blood was more or less impoverished of its red-corpuscles and nutritive constituents, with laxity of tissues, or if he had been living in the impure air of over-crowded dwellings, or in the midst of other conditions favoring typhoid developments, until the plasticity of his blood and the tonicity of his tissues were both impaired, his case would present all the characteristic features and tendencies of an asthenic inflammation.

While it is true, therefore, that it is desirable to allay the irritation and lessen the vascular fullness in the first stage of all acute inflammations, whether sthenic, asthenic, or specific, yet the means for accomplishing these results most safely and efficiently, must vary much in the

* See Meigs and Pepper on Diseases of Children, 4th Ed., pp. 180-1, 1870.

several varieties. Morbid susceptibility may be allayed by anodynes, anæsthetics, and sedatives; and the vascular fullness or congestion may be diminished by lessening the quantity of blood in the vessels of the part either by venesection, by increasing the contraction of the vessels themselves through the influence of the vasomotor nerves, and by lessening the action of the heart in forcing the blood into the vascular system.

A careful examination of the actual clinical results obtained in the management of acute inflammatory affections during the last half century shows that in the first stage of the active sthenic grade of pneumonia one prompt and decisive venesection, followed by such cardiac sedatives as will lessen the force and frequency of the heart's action, is not only the most efficient mode of relieving the vascular fullness, and thereby limiting the amount of subsequent exudation, but it has been followed by the highest ratio of recoveries. In the same stage of those cases occurring in patients whose blood is already diminished in plasticity, and vessels more or less relaxed from malarious influences, from two or three decigrams (gr. iii to v) of sulphate of quinia, given every two to three hours, alternately, with some mild cardiac sedative and alterant, will often as effectually check the vascular fullness as will the bleeding in the purely sthenic cases. In those cases, however, occurring in patients who are living in the midst of sanitary conditions strongly predisposing to attacks of typhoid or typhus fevers, the adjustment of remedies to meet the indications in the first is more difficult. In such patients direct depletion by bleeding is seldom borne without positive injury, and quinia frequently fails to produce the effect desired. When called to this class within the first twenty-four hours after the initial chill, I have usually ordered six powders, each containing sulphate of quinia 0.200 grams (gr. iii); calomel 0.066 grams (gr. i); sanguinaria pulverized 0.033 grams (gr. ss); and glycyrrhiza pulverized 0.066 grams (gr. i); one to be given every four hours, and four cubic centimeters (fl. ʒi) of the following mixture between:

℞ Liquoris Ammonii Acetatis, 60 c. c. ʒii
Tincturæ Opii Camphoratæ, 60 c. c. ʒii
Tincturæ Aconiti Radicis, 4 c. c. ʒi

At the same time cover the whole affected side of the chest with a linseed-meal poultice; and if the skin is hot and dry, have all the surface not covered by the poultice frequently sponged with milk-warm water. As soon as the six powders have been taken, if the bowels have not moved spontaneously, they should be induced to move by an enema or a mild laxative. That the distinctions I have made in regard to the modifications or grades of pneumonia, and the variations which they require in the choice of remedies for fulfilling the indications presented in the first stage of the disease, are neither theoretical nor fanciful, but such as actually confront us at the bedside of our patients, I have had abundance of evidence in my own clinical experience.

From 1837 to 1847, I was practicing in a hilly, rugged region, free from malaria, and supplied with pure air and good water, in the interior of New York, near the northern line of Pennsylvania, where the winters were cold, and during which attacks of pneumonia, pleurisy, bronchitis, and rheumatism were frequent, and uniformly of the sthenic type. In every case, when called during the first stage of the disease, I bled freely once and sometimes twice, and gave internally sedative doses of *tartar*

emetic,* alternately, with alterative and anodyne doses of calomel and Dover's powder.

The relief to the patient was always well marked, and sometimes so decisive as to render the amount of exudation in the second stage unimportant, and to enable the patients to be up and dressed, with all the indications of complete convalescence on the fourth and fifth days. In the spring of 1847, I moved to the city of New York, where, during a residence of little more than two years, I saw but few cases of pneumonia, and those among the poor surrounded by bad sanitary conditions.

In the autumn of 1849, I came to this city, then without sewers, and only a small part of it supplied with lake water. Yet the tide of immigration was such that every boarding-house was over crowded, and we had an abundance of the idio-miasms added to the malaria naturally prevalent in the locality. Here, during the succeeding ten years, I had a rare opportunity for studying the modifying effects of malaria and the causes favoring typhoid fever on all the acute inflammations, both in their separate action and in all degrees of their commingling. I saw, during the latter part of winter and early spring of each year, many cases of pneumonia very promptly relieved by the free use of quinine in the first stage; while in other cases more strongly influenced by the causes of typhoid diseases, the quinine either produced but little apparent effect, or else added much to the dullness of hearing and stupidity of the mental faculties generally; and occasionally a case confronted me with all the characteristics of the sthenic type as strongly as I had seen at an earlier period in the interior of New York, and in which a prompt and full venesection had the same beneficial effects. In a few of the more severe attacks of pneumonia under strongly malarious influences, I have seen much benefit from one very early and free bleeding, followed by quinine in efficient doses. But I have never seen benefit from blood-letting in cases occurring in the midst of such sanitary conditions as decidedly favor the development of typhoid or typhus fevers. In the winter of 1850–'51, in a well-marked case of this variety, I opened a vein in the arm for the express purpose of ascertaining experimentally what the effect would be. Decided indications of syncope came before I had taken an ordinary *teacupful* of blood, and I was obliged to tie up the arm and administer carbonate of ammonia and camphor as restoratives. I have called your attention to the treatment of the first or congestive stage of pneumonia thus fully, because it is only in this stage that measures designed for directly lessening the vascular fullness and consequently rendering the subsequent stages milder and shorter, can be used with benefit to the patient. When exudation has already taken place, and the second stage of the disease is fairly developed, further depletive and sedative measures are useless and generally injurious. In this stage, the continuance of poultices over the chest, and in some cases the addition of a blister, and the administration of alterant, anodyne, and expectorant mixtures, and mild nourishment, will constitute the treatment best calculated to promote resolution and prevent either purulent or caseous degeneration. The following is one of the best alterant, anodyne, and expectorant combinations that I have used:

℞	Ammonii Muriatis,	12.00 grams	ʒiii
	Antimonii et Potassi Tartratis,	0.13 "	gr. ii
	Morphiæ Sulphatis,	0.20 "	gr. iii
	Syrupus Glycyrrhizæ,	130.00 c. c.	℥iv.

* At that time the more prompt and valuable sedative properties of the veratrum viride, aconite, and gelseminum were not known.

Four cubic centimeters (fl. ʒi) may be given to an adult every three or four hours, mixed with a tablespoonful of water. If the urine is scanty, a mixture of two parts of liquor ammonii acetatis, two of spirits of nitrous ether, and one part of tincture of digitalis, may be given in doses suited to the age of the patient, half way between the doses of the other mixture. In most cases from two to three decigrams (gr. iii to v) of sulphate of quinia may be given with benefit, three times a day, until convalescence is established.

In addition to the foregoing outline of the treatment required in the different grades and stages of pneumonic inflammation, I must direct your attention to some special conditions of importance liable to occur during the progress of cases of this disease. One of these conditions is presented in some rare cases at the very commencement of the attack, and consists of an almost universal congestion or engorgement of the pulmonary vessels immediately following the initial chill, indicated by a purplish or leaden hue of the surface; short and hurried breathing with very limited expansion of the chest; small, frequent, and weak pulse; cool extremities, but high temperature of the trunk of the body; fine crepitant râles over the whole chest, and great sense of oppression or weakness. If such cases are seen very soon after the commencement of the attack, it is well to open a vein in the arm, and if the blood can be made to flow freely it speedily lessens the oppressed breathing, improves the color of the surface, and causes the pulse to become fuller and slower. At the same time six decigrams (gr. x.) of sulphate of quinia should be given and repeated every two hours until three doses have been taken, after which the time may be lengthened to four hours. You may gain some further aid in restoring the tone of the pulmonary vessels by giving half way between the doses of sulphate of quinia two decigrams (gr. iii) of ergotine, and after the immediate danger from overwhelming congestion of the pulmonary vessels has been relieved the subsequent treatment may be the same as in other cases of severe pneumonia. But if the venesection results in a failure to obtain more than a few cubic centimeters (fl. ʒii) of dark blood, making no impression on the circulation or the respiratory movements, the whole chest and trunk of the body should be wrapped in a sheet wet in cold water, and the quinine and ergot given internally as just directed. Such cases are met with chiefly in highly malarious districts and are always dangerous; but if the congestion of the first stage can be relieved in a measure, the first crisis will pass by, and the subsequent progress of the case be easily controlled.

Another condition of very much more frequent occurrence may present itself to you in the latter part of the second or during any part of the third stage of the disease. It is indicated by a quick, weak pulse; short and quick systolic action of the heart; a dingy hue of the surface from slowness of the circulation in the cutaneous capillaries and impaired vasomotor influence; dullness on percussion and abundant mucous râles over the affected parts of the lungs; the sputa thin and mixed with blood, or decidedly muco-purulent; the expiratory act short with sudden fall of the abdominal muscles; and the mind either dull and drowsy or wandering. This is the condition described in your books as indicating danger from *cardiac weakness*, and therefore demanding the liberal use of alcoholic remedies, under the impression that alcohol is capable of strengthening the systolic action of the heart. Having already given you the results of my own clinical and experimental observations concerning the incorrectness of this impression, when speaking of the treatment of typhoid fever, I will not repeat what was then said. But as the con-

dition under consideration is the one of chief danger in most cases of severe pneumonia, it is of great practical importance to have clear and correct ideas concerning its nature. Why is the cardiac force diminished and the whole systemic circulation still more enfeebled in these cases? Plainly from two causes. First, the volume of blood in the vascular system has been largely depleted by the exudation and lodgment of from one to two liters (fl. ℥xxx to ℥lx) of it, in the inflamed and hepatized portion of the lungs. Second, the filling up of so large a part of lung structure has so far diminished the oxygenation and decarbonization of the blood that it fails to sustain the sensibility and action of the whole vasomotor and cardiac nervous systems. The negative effect of a deficient amount of oxygen and the positive sedative and anæsthetic effect of an excess of carbonic acid gas in the blood, are obviously the chief agents in diminishing the force of circulation through their anæsthetic and sedative effect on the nervous structures just mentioned. Your remedial measures, then, should be such as will directly increase the activity of the vasomotor nerves, and improve the oxygenation and decarbonization of the blood, and thereby increase the action of the muscular coat of the small vessels and sustain the molecular movements in the secreting organs and tissues generally. To merely increase the muscular force of the heart, if this were possible, without simultaneously increasing the action of the smaller vessels and quickening molecular movements in the tissues, would only result in a temporary show of improvement to be speedily followed by more accumulation in the already obstructed and enfeebled pulmonary capillaries. The measures which I have found best calculated to relieve the condition under consideration, are a fair sized blister over the affected side of the chest, and the use of the following remedies internally. I dissolve ten grams (℥ii ss) of chlorate of potassium and fifteen grams (℥ iv) pulverized gum arabic in 260 cubic centimeters (℥ viii) of water, and give fifteen cubic centimeters or an ordinary tablespoonful every three hours, in conjunction with from thirteen to twenty centigrams (gr. ii to iii) of sulphate of quinia; and half way between these doses four cubic centimeters (fl. ℥i) of the following formula:

℞			
	Liquoris Ammonii Acetatis,	60.0 c. c.	℥ii
	Tincturæ Opii Camphoratæ	30.0 " "	℥i
	Tincturæ Digitalis,	30.0 " "	℥i
	Ammonii Carbonatis,	8.0 grams	℥ii

Mix. Dilute each dose with two tablespoonfuls of sweetened water when given. At the same time I require from thirty to sixty cubic centimeters (fl. ℥i to ℥ii) of milk and fifteen cubic centimeters (fl. ℥ss) of a strong infusion of coffee, to be given every two hours. To this sugar may be added or not as the patient prefers. If when night comes the cough is frequent and the patient restless, I give a single dose of the formula containing muriate of ammonium, which I gave you in the earlier part of the present lecture. During the last thirty-five years I have been called to many cases of acute pneumonia in which the patients had continued to fail notwithstanding the liberal use of alcoholic remedies and nourishment, and have entirely omitted the former, substituting therefor the treatment I have just detailed with the most satisfactory results. The chlorate of potassium indirectly, and the digitalis, coffee and quinine directly, constitute our most reliable cardiac and vasomotor tonics in these cases.

When giving you the clinical history of pneumonia, I stated that cases

had been occasionally met with in which the inflammation terminated in the formation of one or more circumscribed abscesses in the parenchyma of the lung. Such cases are very liable to terminate fatally from exhaustion. But in some instances the abscess has formed an opening into one or more of the bronchi, and the pus has been discharged by coughing in large quantities, often streaked with blood and emitting a more or less offensive odor. If the abscess is not large and the bronchial opening is sufficient to afford free exit to the matter, the patient may steadily improve until full recovery takes place, leaving only a *cicatrix* in the place of the abscess. But if the bronchial opening communicating with the abscess is small, the purulent discharge will take place at irregular intervals, only partially draining the suppurative cavity, and exciting more or less irritation in the lining of the bronchi through which the matter passes on its way out, until the hectic fever and copious night sweats result in entire suspension of nutrition and death of the patient. A few months since, a case of this kind came into the Mercy Hospital, giving the clinical history of an acute attack of inflammation of the lower and middle parts of the left lung, and affording all the rational and physical signs of an abscess in the parenchyma of the left lung, having its center a little below and to the left of the nipple. The patient had begun to discharge by coughing at irregular intervals about twice in twenty-four hours large quantities of pus emitting a very offensive odor. The patient continuing rapidly to fail in flesh and strength, what was supposed to be the center of the abscess was punctured with an aspirator needle by my colleague, Prof. E. Andrews, in one of his surgical clinics. Finding pus, a free incision was made giving exit to a considerable quantity of very thick and offensive pus. An improved drainage tube was inserted and the cavity daily washed out with mild antiseptic solutions. From this time his cough and expectoration diminished rapidly until both ceased, and in a few weeks he had so far regained his flesh and strength as to enable him to attend to his ordinary business, though still under the supervision of the professor of clinical surgery.

Gangrene of some portion of the lung as the result of acute pneumonitis, is still more rare than circumscribed abscesses, and more certainly fatal in its results. The treatment must consist of anodynes to promote rest, antiseptic inhalations to lessen the offensiveness of the breath, and such tonics as tend to sustain the nutritive processes, with as much plain, easily digestible food as the stomach will bear.

CHRONIC PNEUMONIA.

A chronic form of disease of evident inflammatory character is occasionally met with in the connective tissue and parenchyma of the lungs. In one class of cases it has followed as the sequel of a more acute attack of either pneumonia or of broncho-pneumonia, while in another class it has supervened without any preceding acute or subacute symptoms. The cases belonging to the latter class have been described by some writers as true pulmonary cirrhosis resulting from the same form of morbid action in the connective tissue as that which attends cirrhosis of the liver.

Clinical History.—The cases you will meet following acute pneumonic attacks differ much in their symptoms, progress and results. They are capable, however, of being arranged in two groups. Those constituting the first group are met with as the sequelæ of acute pneumonia in patients already affected by some constitutional predisposition or diathesis, such as the scrofulous, tuberculous or syphilitic. In many such cases the primary

pneumonic attack runs its course, and the patient presents the appearance of convalescence. That is, his fever subsides, secretions become natural, appetite returns, and he begins to move about and thinks he will soon be as well as usual. Still, when carefully noticed, he looks unusually pale in the morning and becomes weary from very little exertion; his pulse is found from ten to fifteen beats faster than natural, especially in the afternoon and evening; his respirations accelerated in about the same proportion, with unnatural shortness of breath when walking or ascending stairs; and a failure to regain the usual amount of flesh. After remaining in this condition for a period varying from two or three weeks to as many months, he begins again to cough some, especially in the mornings; to feel occasional pains in his chest; to look more flushed and feverish in the evening, and frequently to sweat in the last half of the night. He thinks he has taken "some cold," and recalls his physician, who now finds him with all the symptoms of incipient hectic fever. His pulse is quick and irritable, varying from 100 to 120 per minute; respirations short and frequent, especially when attempting a little exercise; cough frequent but most severe in the latter part of the night and early morning, accompanied by an expectoration of more or less yellowish muco-purulent matter; temperature varies from 38° C. (101° F.) in the morning, to 40° C. (104° F.) in the evening, with some sweating on the approach of morning; his urine is redder than natural and less in quantity, and his appetite poor. A physical examination shows decided increased fremitus of voice and dullness on percussion over the side in which the pneumonia was primarily located, with tubular respiration and some degree of sharp submucous râles in one or more places which are not temporarily removed altogether by an act of coughing. Such patients now emaciate rapidly; the expectoration becomes more copious and purulent, often containing little masses of caseous matter and sometimes shreds of connective tissue; the night sweats become more profuse; the appetite fails; apthæ appear in the fauces; the intestinal discharges become thin and are repeated from two to four or six times in the twenty-four hours, and the patient generally reaches a fatal degree of exhaustion in from three to six months after the primary attack. These are the kind of cases which were designated by the older writers as *quick* or "*galloping*" *consumption*. An explanation of the symptoms and progress I have detailed is to be found in the fact that the exudative material which accumulated in the inflamed pulmonary structure during the primary attack, was of such quality that instead of undergoing resolution as convalescence approached, it underwent caseous degeneration, and subsequently purulent change; the commencement of the latter giving rise to renewal of active symptoms and the subsequent extensive suppurative changes in the lung structure.

A similar exudation sometimes accompanies a low grade of pneumonic inflammation following a primary pulmonary hemorrhage in persons predisposed to phthisis, and subsequently undergoes the same successive changes, constituting an acute caseous form of consumption as described by Niemeyer and others.

The cases of chronic pneumonia following acute attacks constituting the second group to which I have alluded, occur in a very different class of patients from those I have just been describing, namely, those whose blood and tissue properties favor exudations of a highly plastic character, and consequently tending to permanent organization.

Cases of broncho-and pleuro-pneumonia occurring in previously vigorous and healthy subjects, and still more in those of a rheumatic diathesis,

are the ones most liable to have some part of the pneumonic exudation undergo permanent organization, and consequently continue to fill the alveoli and interstitial spaces after the acute stage of the disease has passed and convalescence is apparently established.

The majority of such patients so far recover as to resume their usual habits and business of life, and for a long time complain only of shortness of breath when exercising or making any extra exertion; of undue sensitiveness to atmospheric changes; of frequent derangements of digestion chiefly from deficient secretion of the gastric juice; and of occasional wandering pains in the chest. But percussion shows less than the natural degree of resonance, and auscultation detects increased fremitus of voice over the affected part of the lungs, with less than the natural respiratory murmur.

If, after six or twelve months have passed the patient comes under examination, the same general condition of health and the same physical signs will be found, together with a contraction of the affected side of the chest, a marked difference in the expansion of the two sides during ordinary inspirations, and a more constant feeling of weariness and dull pain or oppression in the chest. The latter is apt to be increased by exercise of the arms or in the performance of manual labor; and at such times slight feverishness and a dry hacking cough are sometimes present. Some persons remain in this condition of impaired health, yet attending more or less to the ordinary duties of life for many years. But the long-continued deficiency in the performance of the respiratory function, rendering the oxygenation and decarbonization of the blood defective, in most cases ultimately induces fatty, atheromatous, or caseous degenerations either in the affected part of the lung developing all the phenomena of pulmonary phthisis, or in the liver, kidneys, or heart, giving rise to some form of dropsical accumulations, or to progressively increasing cardiac weakness and irregularity ending in vertigo and sometimes paralysis, or sudden death. The remaining class of cases, described by Corrigan and Bastian as constituting true pulmonary cirrhosis, but regarded by Charcot, Wilson Fox, and others as identical with chronic pneumonia, are not of frequent occurrence. You will find the same class of cases described by Drs. Flint, Bartholow, and Palmer, in their respective works, under the name of *fibroid phthisis*. Some other writers have called them cases of interstitial pneumonia or sclerosis of the pulmonary structure. But whatever may be the name adopted, a careful examination of the clinical histories, so far as they are given, show that nearly all the cases are traceable to primary chronic capillary bronchitis, becoming complicated in some stage of its progress with lobular pneumonia, as I described when speaking to you of that form of bronchitis a few days since.

The inflammatory action thus extending into the pulmonary lobules causes increased irritability and growth of the connective tissue and cell walls which, added to the obstructed bronchioles, diminishes the capacity for air, and constitutes a pathological condition perhaps more analogous to sclerosis of the central parts of the nervous structures, than to cirrhosis. Yet the exclusion of air which it involves pretty uniformly leads to marked contraction of the affected lung. Writers generally claim that this form of disease is met with almost exclusively in adult life, and generally between the ages of thirty and fifty years. Yet some of the most characteristic cases that have come under my own observation have been in children between five and ten years of age. My own clinical and post mortem observations have led me to the conclusion that the usual order of anatomical changes in the cases under consideration,

is, first, a true sclerosis from chronic inflammation of the connective tissue constituting the alveolar and lobular septa and vascular walls, forming dense bands and irregular nodules often stained with dark pigment; second, exudations from the congested and obstructed vessels filling the alveoli and interstitial spaces with fibrous material containing lymphoid, spindle-shaped and giant cells much resembling small tuberculous granulations; and third, the same exudative material accumulated in larger masses and presenting various stages of degeneration either calcareous, cheesy, or semi-purulent. It has seemed to me that all these are only different stages of the same morbid processes, often observable at different points in the same section of diseased lung; and differing from primary tuberculosis, in having originated from direct inflammation or hyperplasia of the pulmonary structure and often preceded by capillary bronchitis, pleurisy, or more active pneumonitis. After the disease has progressed for several months, the imperfect and unequal expansion of the chest from the obstruction or obliteration of the alveoli and the exclusion of air, favors dilation of many of the smaller bronchi, and general contraction of the diseased lung, with corresponding contraction of that side of the chest.

Symptoms.—The chief symptoms are a frequent and harassing cough, accompanied usually in all the earlier stages of the disease by only a scanty mucous expectoration, later becoming muco-purulent, and sometimes offensive to the smell; shortness of breath, always increased by exercise; but with less disturbance of the pulse and less emaciation than the other symptoms would lead us to expect. Inspection of the chest shows marked contraction of the affected side laterally, similar to that which often follows attacks of acute pleurisy, and not the flattening or receding of the infra-clavicular region, which is generally seen in ordinary tuberculosis. Percussion reveals increased dullness over the affected side, with here and there tympanitic, amphoric, or cracked metal sounds, owing to different degrees of dilatation of the bronchi, the last named sound existing only when some dilatation has become sacculated and partly filled with muco-pus. Auscultation may reveal only feeble or suppressed respiratory murmur with increased fremitus of voice and some moist bubbling râles; or there may be tubular or cavernous, or broncho-vesicular sounds according to the degree of the bronchial dilatations. When the disease has existed for several years, as is the case with many patients, the long continued contraction of the affected lung, retarding the flow of blood through it, causes the right cavities of the heart to become dilated and the tricuspid valve insufficient, allowing regurgitation or double cardiac murmur and jugular pulse, and sometimes general dropsy. Although the disease is generally very slow in its progress, in some instances continuing from five to twenty years, yet sooner or later the structural changes reach that degree of purulent degeneration which affords abundant expectoration, and ends in extensive emaciation, hectic fever and fatal exhaustion.

Pulmonary hemorrhages occur during the progress of many of this class of cases, but not in all.

Prognosis.—The cases belonging to the class of chronic pneumonia now under consideration, are seldom recognized by accurate examinations until the anatomical changes in the lung tissue, just described, have become well established, and then they are incapable of removal. Consequently the prognosis is very unfavorable, although the progress of the disease may be retarded, and sometimes kept stationary, for a long period, by judicious treatment, and still more by a residence in a mild and dry climate.

Treatment.—As I have just remarked, in reference to the prognosis in the last variety of cases described, so I may say in reference to all the varieties of chronic pneumonia, when they have progressed so far as to develop well established structural changes, they are not curable in the sense of complete restoration to health. Yet much may be done throughout all stages of their progress to palliate the more distressing symptoms and to prolong the lives of the patients. And in some cases when the diagnosis is made early and the treatment adopted judicious and faithfully pursued, permanent recoveries have taken place. To give each patient the full benefit which his case is capable of receiving from appropriate treatment, you must have an accurate knowledge of the actual pathological conditions existing in each case, which can be gained only by a careful tracing of its history, its present general symptoms, and a thorough application of the methods of physical examination and diagnosis. While attending cases of acute pneumonitis, whether of the lobar or lobular variety, in which hepatization has characterized the second stage, you should regard it as a necessary rule of practice to note carefully the progress of resolution during the decline of the disease. And when convalescence appears to have been fairly established it is proper to give the affected side of the chest a careful examination by auscultation and percussion. If the continuance of well marked dullness on percussion and imperfect inflation of the lung in ordinary inspiration, shows that the resolution or clearing up of the lung structure is tardy or incomplete, it should receive careful attention. If the patient is known to possess a scrofulous or tuberculous tendency, either hereditary or acquired, special care should be taken to promote healthy nutrition by a sufficient variety of easily digestible food, aided by such remedies as the syrup of lacto-phosphate of calcium, syrup of iodide of calcium, compound syrup of the hypophosphites, and cod-liver oil when it is well received by stomach, and as good a supply of pure air as possible. Exercise is also important, and should consist at first in gentle or cautious efforts to inflate the lungs two or three times a day, but may be gradually extended until it embraces riding, driving, and moderate walking, ending when necessary and practicable in a change to a milder and dryer climate at moderate elevations. By such a course, promptly adopted and judiciously executed, you may arrest the further caseous degeneration of the exudate in the lung and induce its ultimate calcification or disappearance by slow disintegration and removal. But if in spite of your best directed efforts the deteriorative changes progress until caseous and purulent products are completed, with rapid emaciation and hectic fever, you can do but little more than palliate the more troublesome symptoms by measures which will be more fully explained when I come to speak of the management of the advanced stage of tubercular phthisis.

When the exudate in the acute stage of pneumonitis has been unusually plastic, leaving after convalescence the alveoli and interstitial spaces filled by permanently organized false tissues as I have previously described, advantage may be gained by a somewhat protracted use of either the iodide of potassium or muriate of ammonium in moderate doses three times a day, and the daily practice of cautious but full inspirations and such training of the chest and arms as is calculated to re-establish as good a capacity for air as possible. In those cases following attacks of capillary bronchitis complicated with lobular pneumonia, which I have described as including both the fibroid or catarrhal phthisis and the pulmonary cirrhosis of different writers, I have found no combination of remedies more efficient in allaying the cough, lessening the soreness and feeling of

constriction in the chest, and promoting the removal of the exudative material without suppuration, than the formulæ containing muriate of ammonium, already stated to you during the present lecture.* To adults it may be given in doses of four cubic centimeters (fl. ʒi) from two to four times a day, according to the severity of the symptoms. The functions of the digestive organs, including regular evacuations, should be sustained by the use of mildly laxative and tonic remedies, and by such judicious exercise daily in the open air as the patient is able to endure without fatigue. Many of the cases belonging to this class are much benefitted by the inhalation of resinous and anodyne vapors. Perhaps the best of these is the combination of carbolic acid, oil of scotch pine, and camphorated tincture of opium, which I mentioned when speaking of the treatment of certain conditions in the progress of chronic capillary bronchitis.† But the most important of all remedies for this class of patients, is an early and judicious choice of a residence in a mild and genial climate. The southern part of California, the district of Texas represented by San Antonio, some places in New Mexico, and many in Mexico, afford residences of the greatest value to a large proportion of these cases, if made available before the structural changes have advanced too far. It is the mild, dry, and pure air at moderate elevations (from 1,500 to 3,000 feet) in these districts of country that is most beneficial. For a temporary residence during the winter months, the orange grove regions of the interior of Florida, and many other places in the interior and moderately elevated districts of Georgia, Alabama, and South Carolina, afford good advantages. For such as need the influence of sea-air in connection with mildness of climate, the Bermuda and Sandwich Islands are well adapted; and the Bermudas especially are easy of access for the citizens of this country.

LECTURE XLV.

Pleuritis—Acute and Chronic: Their Clinical History, Anatomical changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The remaining important structure constituting a part of the respiratory organs, the inflammations of which I have now to consider, is the serous membrane called the pleura, which forms both an external covering of the lungs and an internal lining of the parieties of the chest. Consequently the membrane on each side constitutes a closed or complete sac, the smooth, free surface of which is covered with a single layer of endothelial cells and is everywhere in contact with itself. In the natural condition the surface is constantly moistened by a small quantity of serous fluid. In addition to the layer of endothelial cells on the surface, the membrane is composed of white connective and elastic fibers; a net work of capillaries derived from the larger vessels in the subserous layer of tissue, and lymphatics. The pleural membrane may be attacked with inflammation at any period of life, and at any season of

* See page 429.
† See page 409.

the year; although much the larger number of cases occur in the colder months of the year, and in such climates as are characterized by sudden and extreme changes in the thermometric and hygrometric conditions of the atmosphere. Males appear to be more liable to the disease than females. The great majority of attacks are unilateral, but in some rare instances the inflammation invades both membranes at the same time and is called double pleuritis. On the other hand it may be limited to only a small part of one pleura, constituting circumscribed pleuritis.

The grade of the inflammation may be acute and rapid in its progress, or chronic and persistent in duration.

Symptoms of Acute Pleuritis.—An attack of acute pleurisy is generally abrupt in its beginning and characterized by well marked symptoms. In some cases, however, slight pains and feelings of depression are noticed for two or three days prior to the commencement of the more severe symptoms.

Most of the acute cases are ushered in by a chill or brief period of rigors, accompanied by paleness and coolness of the surface, small pulse, short and unsteady respiratory movements, and sharp piercing pains in one side of the chest, more frequently in the sub-axillary region than elsewhere. The coldness soon gives place to heat and dryness of the surface; some flush of redness in the face; a full firm pulse accelerated in frequency to 90 or 100 per minute; respirations short and frequent being voluntarily stifled as much as possible to prevent the increase of pain in the side; a short, dry cough which, like the respiratory movements is suppressed as much as possible to prevent increase of pain.

The secretions generally are diminished, as in other acute inflammations, and the tongue in most cases covered with a thin white fur. If the affected side of the chest is examined within eighteen or twenty-four hours after the initial symptoms by auscultation and percussion, the only unnatural sign discoverable will be a rubbing or friction sound synchronous with the respiratory movements. If the examination is made at any later period during the progress of the disease, in most cases the friction sound will have ceased, and in its stead you will find marked dullness on percussion, increased vibration of voice, in some cases amounting to œgophony, and absence of respiratory murmur. These signs indicate the commencement of the second or exudative stage of the inflammatory process with sufficient effusion of serous fluid to separate the surfaces of the pleura by compressing the lung, and to some extent, increasing the size of the affected side of the chest. In all the more acute cases, the symptoms of general irritative fever, sharp local pains, and stifled respirations, continue without abatement from three to five days, or until the accumulation of inflammatory products in the cavity of the pleura and its consequent distension with serous or sero-purulent fluid, has become sufficient to render the oxygenation and decarbonization of the blood defective. Then, the temperature begins to diminish; the pains to be less acute and less frequent; but the shortness of breath and sense of oppression in the chest have increased, the pulse has become smaller and more frequent, and the patient complains much of weariness, yet is wholly unable to rest in any other than the sitting or semi-erect position.

In some of the most severe cases, by the end of the first week the sac of the inflamed pleura has become fully distended rendering the whole affected side of the chest completely dull on percussion, considerably enlarged with the intercostal spaces bulging or convex, and the lung compressed into the upper and back part of the chest, thereby suppressing

all respiratory sounds and restricting the motions of the chest in inspiration and expiration to the well side. If the left pleura is the seat of the disease its distension to the extent just described will push the heart from its natural position further to the right until its impulse and natural sounds are both felt and heard to the right of the sternum. As a general rule the crisis of the disease is reached by the end of the first or during the first half of the second week of its progress, after which the febrile symptoms and local pains soon cease. But the shortness of breath and all other symptoms and physical signs caused by the mechanical distension of the pleural sac will abate more slowly, and may keep the patient confined several weeks before the accumulated inflammatory products will have been entirely removed and the respiratory function freed from embarrassment. In the milder cases, however, the first or stage of vascular engorgement will occupy from one to two days; the second or stage of exudation and effusion from three to five days; and the third or stage of resolution and re-absorption of inflammatory products only from seven to nine days more, making the average duration of such cases from eleven to sixteen days.

The symptoms and clinical history I have thus far given you apply with sufficient accuracy to the great majority of cases of acute pleuritis as they are met with in general practice. But there are several deviations from the usual course of the disease, of sufficient importance to require attention. In a few instances, even of unilateral pleuritis, the serous effusion into the pleural sac accumulates so rapidly during the second stage of the inflammatory process as to completely compress the one lung and crowd the mediastinum so far to the opposite side as to materially lessen the expansion of the other. In such cases the patient feels a most distressing sense of suffocation and exhaustion from want of air; his extremities become cold, and the whole cutaneous surface passively congested or cyanozed; the pulse is small, frequent and feeble, and unless speedily relieved by surgical interference, the patient dies from apnœa or insufficient supply of air to the pulmonary alveoli.

A case of this kind was received into the medical department of the Mercy Hospital a few years since, in which the symptoms of suffocation were so urgent that I deemed it necessary to diminish the amount of effused fluid by tapping the affected side of the chest, at once, with an ordinary trochar. Four liters (between 8 and 9 pints) of serum were drawn off, much to the relief of the patient, who subsequently recovered. The danger of death from compression of the lungs during the second stage of the disease is much greater when the inflammation has attacked the pleural membrane in both sides of the chest at the same time. Another deviation from the ordinary course of the disease is manifested by the occurrence of one or more chills during the second stage followed by higher fever, more rapid pulse, shorter breathing, and greater restlessness, ending in from six to twenty-four hours by a copious sweat. The fever now assumes a distinct hectic type, with rapid loss of flesh and strength, while the signs of fluid accumulating in the pleural sac daily increase, until the symptoms of exhaustion and approaching apnœa indicate extreme danger to life. The occurrence of the chills and more decided hectic symptoms usually indicate the commencement of the suppurative process in the inflamed membrane, and the consequent intermixture of pus with the serous effusion. In some cases the accumulated fluid consists wholly of pus, constituting empyema, as distinguished from serous and aqueous accumulations called hydrothorax. In some of the pleuritic inflammations occurring in tuberculous subjects, the inflammatory affection

is circumscribed or limited to a small portion of the membrane, is slower in its progress, accompanied by less active general febrile phenomena, and yet the resulting accumulation of sero-purulent fluid may be as copious and as oppressive to the respiratory function as in cases involving a larger part of the membrane.

It sometimes happens in cases of suppurative pleuritis, especially when connected with the suppurative stage of pulmonary tuberculosis, that gases as well as pus are formed in the pleural cavity adding to the distension of the side and embarrassment of respiration, and yet giving you increased or tympanitic resonance instead of dullness over a large part of the affected side. The same effect is capable of resulting from the perforation of the pleura by the extension of superficial tubercular abscesses or cavities in the lung, and the escape of air as well as matter into the pleural sac. One more deviation which you may occasionally meet with, results from the unusually plastic quality of the exudative material that accumulates upon the surface of the inflamed membrane during the earlier stages of the disease. In some rare cases the exudate will be wholly plastic, and by undergoing rapid organization into a layer of false membrane, will result in the firm adhesion of the pulmonary to the costal pleura. In such cases the symptoms of the first stage undergo less change during the second; the layer of plastic exudate not occupying sufficient space to either compress the lung or perceptibly enlarge the affected side of the chest, the respiratory murmur and even some friction may continue through the whole of the second stage, and the dullness from percussion usually so strongly marked in cases attended by serous effusion, does not supervene. The adhesions formed during the active stage of these cases, remain after convalescence and generally through life. During the first few months they are apt to cause some feeling of constriction or embarrassment when the patient takes full inspiration or exercises actively. And the same causes often occasion slight pains or temporary feelings of soreness in the affected side of the chest. But in nearly all the cases the layer of new or adventitious tissue which constitutes the bond of union between the two surfaces of the pleura, under the constant influence of the respiratory movements, becomes gradually more smooth, attenuated in structure, and its fibers elongated, until it ceases to produce any perceptible embarrassment or inconvenience to the patient. More serious results, however, attend and follow attacks of acute pleuritis in many young and vigorous subjects. They are cases in which the second stage of the inflammatory process gives rise to both copious serous effusion and abundant plastic exudate. The former rapidly distends the pleural sac and compresses the lung, producing all the symptoms and physical signs I have already mentioned when giving the history of ordinary cases of the disease; while the latter, continuing to accumulate on the surface of the pleura covering the compressed lung, becomes so firmly organized during the protracted period, sometimes intervening before the effused fluid is re-absorbed or otherwise removed, that it effectually resists the renewal of expansion of the lung in proportion to the removal of the serous fluid. This not only subjects the patient to a continuance of shortness of breath and all the consequences of diminished capacity for air after the establishment of convalescence, but the ribs and walls of the affected side of the chest yielding to atmospheric pressure become depressed or sunken laterally in proportion to the deficiency of expansion of the lung. In some cases this permanent lateral contraction of the chest is sufficient to cause a lateral curve in the spine and tilting of the shoulders, constituting a marked deformity of the chest.

Having given you, thus in detail, the symptoms which characterize the several stages of acute pleuritis and the pathological changes accompanying them under the varying circumstances in which the disease may occur, but few words need be added concerning the symptoms and progress of the disease in its chronic form.

Chronic Pleuritis.—This grade of the disease may follow as the sequel of an acute attack, but is much more frequently chronic or subacute from its beginning. Cases have been met with at all periods of life, though very much the larger number occur between the ages of fifteen and forty years. Patients suffering from pulmonary tuberculosis and from albuminuria dependent on either acute or chronic renal disease, are more liable to attacks of chronic inflammation of the pleura, yet the larger number of cases of the last named disease occur in persons previously in fair health, and without any recognized cause. I have seen a considerable number of cases that were traceable to the effects of mechanical violence from blows, falls, or severe strain upon the chest; and some others that were clearly the result of sudden exposure to wet and cold.

Symptoms.—In the chronic form of pleurisy, the subjective symptoms in the early stage are generally slight; so much so that in many cases the patients neither cease attending to their ordinary business nor think it necessary to consult a physician, until the second stage is far advanced and the amount of the serous effusion is sufficient to compress the lung and render the respirations uncomfortably short. Yet on close examination nearly all the patients acknowledge that they have had more or less pains, or sense of soreness in the affected side of the chest, increased by active exercise or full inspirations, from the commencement of the disease. And in addition most of them complain of having had slight chills alternately with flushes of heat, dryness of the mouth, variable appetite, scanty and high colored urine, and imperfect digestion of food. After these mild and apparently unimportant symptoms have continued from two to four weeks, there are added shortness of breath, especially when taking active exercise or when lying in a horizontal position on the well side; a short dry cough; moderate acceleration of pulse; and general sense of weariness. The objective symptoms, or those developed by direct physical examination of the patient, are more characteristic and therefore important in making a correct diagnosis. In nearly all the cases the clinical thermometer will show a temperature at least one or two degrees above the natural standard; and during the early stage auscultation will reveal some degree of rubbing or friction sound, increased by full inspirations, but often limited to a small space on one side of the chest. At this stage no changes are usually detected by percussion and measurement. At a later stage, however, when the patient begins to be embarrassed from shortness of breath, auscultation will reveal neither friction nor respiratory murmur over the affected side, but in their place sometimes tubular sounds and some increased fremitus or vibration of voice; while percussion will elicit decided dullness over the most dependent part of the chest in whatever position the patient may be placed, accompanied by increased fullness or bulging of the intercostal spaces and diminished respiratory movements. These signs taken together with the subjective symptoms indicate very certainly an accumulation of fluid in the cavity or sac of the pleural membrane sufficient to compress the lung; and the subsequent progress of different cases may develop all the varied consequences and changes that I have already described as liable to follow accumulations of serum, pus, or gases resulting from attacks of acute pleuritis. When the effusion resulting from chronic pleuritis is serous,

constituting one of the forms of hydrothorax, the slower progress of the accumulation causes less embarrassment to the respiration than when it takes place more rapidly in the acute form, and consequently is sometimes allowed to continue until the quantity of fluid and degree of distension of the pleural sac is greater than in any other class of cases. In cases involving suppurative action in the inflamed membrane, causing the effused fluid to be pus, constituting pyothorax or empyema; or a mixture of serum and pus, constituting hydro-pyothorax; the more rapid loss of flesh and strength, and the more decided febrile movements accompanying such cases, usually lead either to earlier surgical interference for the removal of the pleural accumulation or the death of the patient, before the quantity accumulated has become so great as in the cases of serous effusion. Gases or air may accumulate in the pleural sac during the progress of chronic pleuritis under the same circumstances as I mentioned in relation to the acute form of the disease.

Pathological Anatomy.—The structural changes which accompany the several stages of acute and chronic pleuritis are the same in kind as take place in all inflamed structures. At first the blood rapidly accumulating in the capillaries and smaller vessels gives the membrane an intensely red and tumefied appearance. A few hours later you may find the white or migrating corpuscles and liquor sanguinis passing from the overdistended capillaries into the interstitial spaces of the membrane and upon the free surface where its fibrinous element rapidly solidifies into patches or a layer of white pseudo-membrane adherent to the endothelial layer of cells upon the surface, while the watery element of the effused fluid accumulates in the pleural sac, holding in solution more or less albumen and enough leucocytes and detached endothelium to give it a slightly turbid appearance. In many cases you may also find red corpuscles entangled in the meshes of the fibrinous exudate, both in the structure of the membrane and on its free surface.

If the inflammatory process should be protracted or degenerate into the chronic form you will have added to the inflammatory products already mentioned, lymphoid cells and hyperplasia of the connective tissue, causing the membrane to appear thicker and harder than natural. During the third or declining stage of the disease, all these inflammatory products may undergo disintegration and removal by absorption, constituting resolution and recovery; or the cell elements may degenerate into pus corpuscles, much of the fibrin into fat granules, and these with the serous effusion continue to accumulate until, partly by mechanical compression of the lungs and in part from exhaustion, the case reaches a fatal termination, as I have already described.

Prognosis.—A very large majority of the cases of uncomplicated pleuritis, confined to one side of the chest, terminate favorably. When the inflammation attacks the membrane in each side of the chest at the same time, and is accompanied by much serous effusion, there is great danger of a fatal result from apnœa. Cases that become complicated with pneumonia, pericarditis, or acute nephritis are more dangerous than when uncomplicated, and still more so are those that occur during the progress of chronic renal diseases, pulmonary tuberculosis, or constitutional syphilis. The pleuritic inflammation, whether acute or chronic, when occurring in connection with the last named constitutional conditions, is very liable to take the suppurative form and lead to purulent or sero-purulent accumulation and a persistent wasting of flesh and strength until death results from asthenia. Early evacuation of the purulent accumulations, efficient drainage, and the judicious use of antiseptics, tonics, good food and pure

air will relieve many of this class of cases, and enable them to live many months, or until the further development of the coincident constitutional disease cuts them off.

Diagnosis.—In giving the clinical history of acute and chronic pleuritis I have already directed your attention to the symptoms and physical signs that characterize each stage in the progress of all grades of the disease, close attention to which will enable you not only to determine whether pleuritic inflammation exists as distinguished from other affections, but also the stage of its advancement and the pathological consequences which may have resulted, more especially as regards the quality and quantity of accumulated inflammatory products. The affections most liable to be confounded with pleurisy are neuralgic pains in the intercostal or phrenic nerves, acute and subacute rheumatic inflammation in the intercostal structures and diaphragm, and inflammations of the pericardium, spleen and liver.

If you remember that the two former are usually unaccompanied by increase of temperature and equally free from any abnormal sounds to be obtained by auscultation and percussion in any stage of their progress, while pleuritic inflammation involves both, you can hardly fail to differentiate the one from the other. The rheumatic inflammation may be accompanied by some acceleration of pulse and febrile heat, but the pain is more continuous, less lancinating or sharp, and auscultation and percussion yield none of the physical signs that I have mentioned as accompanying the first and second stages of pleuritis. Inflammatory affections of the liver and spleen not only present symptoms chiefly located below the diaphragm and peculiar to those organs, but they fail to induce any physical signs of disease in any part of the chest. While the general symptoms, character of pain and physical signs are similar in both pericarditis and pleuritis, yet in the one they are synchronous with the action of the heart, and in the other with the respiratory movements. Very rarely, however, a case may be met with in which the inflammation will occupy that part of the left pleura connected with the pericardium and will give an audible friction with the movements of the heart.

Treatment.—The objects to be accomplished in the treatment of acute pleuritis are the same that are presented to us in the treatment of acute inflammation in any of the other tissues of the body. As I have explained in previous lectures the means for accomplishing these objects may vary some with the nature of the structure involved in the inflammation. When the structure involved is highly vascular, like that of the parenchyma of the lung, the indication for lessening vascular fullness or congestion in the first stage is predominant over all others. But when the structure involved in the inflammation is less vascular, composed more largely of connective tissue, like the serous membranes of which the pleura is one, the fulfillment of this indication is of less relative importance than that which relates to the removal of the morbid sensitiveness of the structure and the intensity of the pain. While in pneumonia, as I have stated in preceding lectures, the degree of vascular engorgement in the first stage determines the amount of exudation in the second, which may directly obstruct the function of oxygenation and decarbonization of the blood to such a degree as to endanger life; in pleuritis the exudation, whether serous or plastic, although occasioning inconvenience, causes no direct danger to life except in extreme cases.

The intensity of the pain that the patient suffers, the voluntary stifling of respiration, and restlessness, are all effects which contribute much to prolong the disease. And yet, the practitioner should keep both these

indications in view; namely, that of relieving the vascular fullness in the first stage of the inflammatory process, and of subduing pain and the morbid excitability of the structures, adjusting his remedies to the removal of both in accordance with their relative importance in each individual case. The accomplishment of the first indication, namely, lessening the vascular fullness, may be effected by three classes of remedies; first, direct abstraction of blood by venesection or local bleeding; second, by arterial sedatives, which, by diminishing the heart's action, lessen the amount of blood taken to the inflamed part in a given time; third, by the use of evacuants, which, acting upon the bowels and kidneys, increase the discharges and thereby indirectly deplete the circulation. The accomplishment of the second indication is most promptly and efficiently obtained by the judicious use of opiates. In the more severe cases of acute pleuritis, occurring in subjects previously healthy, and in the active period of life, characterized by sudden development of acute pain, followed rapidly by pyrexia or increase of temperature, full pulse, and dry skin, the most reliable and efficient treatment will be the opening of a vein and the abstraction of such an amount of blood as will cause a decided diminution of pain, lessen the fullness and tension of the pulse, and cause a little paleness of the features. Thus is produced within a few minutes that abatement in the symptoms and arrest of determination of blood to the inflamed part which would require several hours for accomplishment by the best cardiac sedatives. To hold the advantage thus gained, however, you should follow the venesection as speedily as possible, by the use of veratrum viride or aconite or a combination of veratrum viride and gelseminum in such doses, repeated with such frequency as to induce an early sedative effect—if possible, before reaction has taken place from the effects of the venesection. At the same time to relieve the pain and restlessness of the patient and overcome that element of the inflammatory process which consists in morbid excitability of the textures, such doses of some one of the preparations of opium, combined with an alterant, should be given between each of the doses of the sedative, as will completely control pain and keep the patient moderately at rest.

For these purposes, probably a combination of the sulphate of morphia in doses of two centigrams (gr. $\frac{1}{3}$), with calomel six centigrams (gr. i), bicarbonate of sodium three decigrams (gr. v), given in the form of a powder with a little white sugar, and repeated every three or four hours, would accomplish the object as efficiently as anything that could be used. The veratrum viride or aconite that are given as sedatives alternately with these powders, may generally be given in combination with nitrous ether and liquor ammoniæ acetatis—which not only make a good vehicle for the sedative but also exert some influence in promoting secretions from the skin and kidneys. In the great majority of cases, even of the most severe and acute attacks of pleurisy, one free bleeding, sufficient to produce the effects I have mentioned (it will usually require from twelve to twenty-four ounces of blood), followed by the remedies which I have indicated, will be found sufficient to overcome all the more active symptoms. It will make the patient more or less inclined to sleep, cause the pulse to become softer and more compressible. The skin will become somewhat moist by the end of the first twenty-four hours of the treatment. If this is the case, and on careful examination by auscultation and percussion, the friction sound of the first stage is either much diminished or removed, and the indications of effusion, such as increased dullness on percussion and absence of respiratory murmur

do not indicate a very considerable amount of exudation or effusion, it will be sufficient to continue the cardiac sedative in moderate doses, suspend the use of the powders for the present and give in their place a saline laxative sufficient to produce a moderately free movement of the bowels. After the bowels have been freely moved, if there is no return of acute pain or restlessness, the patient may be put upon a prescription composed of nitrous ether, liquor ammonii acetatis and camphorated tincture of opium, each sixty cubic centimeters (℥ii), and tincture of digitalis thirty cubic centimeters (℥i), of which four cubic centimeters or an ordinary teaspoonful may be given every three hours in place of the previous cardiac sedative, and a dose of the compound powder of opium, ipecacuanha and nitrate of potassium five decigrams (gr. viii), given at bed-time. These remedies, by continuing the action upon the skin and kidneys, and the powder at bed-time, by procuring rest, will usually render the patient comfortable through the third, fourth or fifth days, while the moderate amount of effusion that had taken place is re-absorbed, leaving but little physical evidence of any accumulation in the cavity of the pleura. The patient is now convalescent, requiring but little additional care except to avoid exposure, subsist upon a mild diet, and avoid active physical exercise, until an ordinary degree of strength is regained.

I have seen many cases of acute pleurisy occupying but one side of the chest, that under this management were completely relieved, and the amount of exudation either plastic or serous so limited as to lead to no serious embarassment of the respiratory function in any part of its progress. But to insure this success it is necessary that the treatment be commenced actually during the first stage of the inflammatory process, which, as I have already stated in giving the clinical history, lasts usually not more than twelve or eighteen hours after the initial chill and symptoms of the attack. But in some cases, notwithstanding the early and judicious use of the remedies I have indicated, on the second and third days of the treatment it will be found that the pain, although much abated, is nevertheless quite sharp whenever the patient attempts full breathing or any freedom of bodily motion; that the temperature continues more elevated and the physical signs of exudation and effusion rather more marked. Where this is the case I add to the foregoing treatment counter irritation by blisters. The application of a blister four by six inches over the most painful part of the affected side will very frequently afford great relief, and in conjunction with the other remedies will arrest the further progress of the inflammatory process, leading to the early re-absorption of the effusion that exists in the cavity of the pleura. In the milder cases of acute pleurisy, or those occurring in subjects less vigorous, or weakened by any previous constitutional impairment, the abstraction of blood by venesection is usually unnecessary and inexpedient. In some of them local bleeding by leeches or by cupping may still afford decided aid in the early stage of the disease, but, omitting the bleeding, such cases may be overcome sufficiently early by the use of the other agents that have been recommended.

Again, the cases in which you will be called, where the first stage of the disease has already passed by, and when you find on your first examination of the patient that instead of the friction sound you have decided dullness on percussion, in most of them increased fremitus of voice and absence of the respiratory murmur, constituting evidence of decided effusion, no idea of abstraction of blood either by venesection, leeches or cupping should be entertained, as that would only serve to deplete the patient without any beneficial effect upon the progress of the disease.

The treatment now should be commenced with a view of arresting the further effusion of serum or exudation of plastic material on the one hand, and of hastening the re-absorption or removal of what has already taken place on the other. For these purposes open the bowels by a mild saline laxative, administer every three or four hours the mixture which we have already mentioned, consisting of nitrous ether, liquor ammonii acetatis, camphorated tincture of opium and digitalis, to which we may now add iodide of potassium in such proportions that the patient will get three decigrams (gr. v) of the latter in each dose. Apply a blister at once to the affected side of the chest, and if the effusion appears slow in diminishing, the blistering may be repeated two or three times at intervals of three or four days. Under these measures the great majority of cases, although having passed the first stage before they are brought under treatment, will begin to improve and continue slowly to do so, until the removal of the effused fluid, the re-expansion of the compressed lung and the establishment of convalescence have taken place. But in many of them it will require two to four and sometimes six weeks to accomplish this end. In those cases which are sometimes met, in which the amount of the effused fluid in the cavity of the pleura is so great as not only to completely compress the lung on the affected side, but to crowd the mediastinum in the opposite direction, lessening also the space for the expansion of the other lung, thus causing the patient to suffer the severe consequences of imperfect æration of the blood, causing a distressing sense of suffocation and inability to lie down, it is not proper to wait for the slow process of absorption of the effused fluid. The practitioner should proceed at once to relieve the suffering and danger to which the patient is exposed by the removal of the effused fluid with the aspirator; a method which is usually safe and easily practiced. There is another motive in such cases for proceeding at once to withdraw the effused liquid, and that is to avoid the danger that would occur from keeping the lung long compressed until it had become bound in this position by a covering of false membrane. If this is permitted, there would remain after the patient's recovery in other respects, a permanent impairment of the capacity of that lung, a shrinking of that side of the chest, constituting a deformity, and making the patient more liable to subsequent degeneration of the lung, and would ultimately shorten life.

There is another class of cases in which, though the effused fluid is not so much in quantity as to produce direct danger from suffocation, yet is sufficient to closely compress the lung on the affected side, and in which, from the previous healthy condition of the patient, we have reason to suppose that there is a liberal amount of plastic exudation covering the compressed lung in addition to the effused fluid.

In these cases re-absorption, under ordinary treatment, takes place very slowly, thereby indicating clearly that to wait for the completion of the process would require several weeks of time and as has been explained, would render probable the permanent binding of the lung in this compressed condition. Under these circumstances it is the duty of the practitioner to aspirate the chest. This may be done slowly at one operation, giving the patient time to inflate the lungs as the process of drawing off the fluid is very gradual, or only a part of the fluid be removed at one time; delay twenty four hours and then another part may be taken, until the whole is removed in successive punctures thus giving opportunity for the compressed lung to regain its expansion in proportion to the removal of the compression. You will notice that in speaking of the most active and severe cases in the first stage, I have mentioned the use of a powder con-

sisting of the sulphate of morphia, calomel and bi-carbonate of sodium. The chief object of giving that powder, aside from the anodyne effects of the morphia, was to induce the early effect of the mercurial in conjunction with the bi-carbonate, in lessening the plasticity of the inflammatory exudate. In other cases which are sometimes met with, though rarely, in which the exudation is almost entirely plastic, there is not apt to be in the second stage of the disease sufficient serous exudation or material to compress the lung, but a copious plastic exudation continues to modify the friction in the second stage, usually leading to extensive adhesions of the two surfaces of the pleura together. In such cases the free use of the carbonated alkalies internally, and efficient alterative doses of the mercurial as far as will be borne without producing a visible effect upon the patient's gums or breath, and then following the mercurial by moderate doses of the iodide of potassium in addition to the carbonated alkalies will be more efficient than any other treatment in first arresting the accumulation of these plastic exudates, and subsequently in hastening their disintegration or, at least, partial removal. But most of such cases to which we give efficient alterant and alkaline treatment, with blisters externally, though recovering well, will leave more or less permanent adhesion of the surfaces of the pleura to each other. These adhesions usually cause a feeling of constraint on taking a full inspiration and sometimes a slight sense of soreness for a considerable time after convalescence, but ultimately become attenuated and smooth by the continued motions of the chest. And although they may continue through the subsequent life of the patient they will usually create little or no inconvenience.

In the management of ordinary cases of acute pleurisy the patient should be kept at rest in the first stage, and a very mild, simple diet, consisting chiefly of milk and animal broths given in small quantities. In the second stage, a little more liberal amount of nourishment and simple, cooling drinks are all that are required. Occasionally one of the most acute class of cases, during the first two or three days, will present a temperature so high that antipyretic measures, more especially free sponging of the surface with cold water, or even wrapping the chest and body in a wet sheet, will be advisable and productive of much relief. But in the great majority of cases these special antipyretic measures are not necessary. As you are aware, during the last quarter of a century, the practice of venesection in almost all diseases has been so nearly abandoned and the use of opium for overcoming inflammations, even of an acute character, so generally commended, that you may doubt the expediency of the recommendation I have made, to commence the treatment of the more acute cases in the first stage with a free venesection. You may be induced to disregard that full, tense pulse, rapid development of temperature, giving severe pain and stifled breathing, which indicate the true sthenic acute inflammatory process, and attempt to subdue such cases simply with opiates and cardiac sedatives without the abstraction of blood. In the larger proportion of cases I admit that you can succeed; but in many of them, while you succeed in the end, the time required is much longer, the amount of effusion and compression of the lung is greater, the patient is subjected to greater danger of secondary consequences of a bad character, and occasionally an instance is met with in which the attempt to administer full doses of opium, without first lessening the arterial tension, is followed by direct aggravation and increase of all the symptoms. A case of this kind occurred under my own observation many years since. A strong laboring man, about twenty-five years of age, of a

sanguine temperament, accustomed to daily labor, was attacked with all the symptoms of acute pleurisy in the latter part of the afternoon while at his work. The pain was so severe that it was with difficulty he could reach his home. On his way he stopped at my office for advice. Having just read some accounts from high authority of the ability to subdue acute inflammation of the serous membranes by full doses of opium, I ordered for this patient six powders, each containing thirteen centigrams (gr. ii) of powdered opium and three decigrams (gr. v) of nitrate of potassium, with instructions to take one of them as soon as he reached his home, and to repeat the dose every two hours, till his pain was subdued. In about eight hours I was called in great haste to see him, and found the patient wildly delirious, face deeply suffused with redness, pupils small, head hot, pulse full, and requiring two persons to keep him in his bed. He had taken the fourth powder of his opium and nitrate of potassium with no other effect than to have each powder followed by increase of the delirium and fever. I immediately opened a vein in his arm, letting the blood flow in a full stream, and when I had taken about one liter (℥xxx) of blood he became calm, free from delirium, pulse soft, and a little moisture started out upon his forehead and face.

As I stopped the flow of blood some sensation of syncope, sufficient to bring a full sweat over the surface, ensued. I told the attendants to continue his powders, one every four hours, and left him. The result was, he passed into a quiet sleep, remained so for four or five hours, sweating freely, and the following day was found almost free from fever, no continuous pain in his side, and but moderate stitches of pain in attempting to take a full breath, but there was some degree of dullness of the left side of the affected part of the chest and absence of respiratory murmur sufficient to indicate a moderate degree of effusion. His bowels were opened by a saline laxative, light counter-irritation applied over the affected side, the patient kept at rest for two days, and his convalescence was complete. I relate this case to show the difference between the effects of administering opiates at once with a tense, hard pulse, in the beginning of acute inflammation, and the effects of the same remedy when through lessening the amount of blood in the vessels, that arterial tension has been removed and the whole tone of the vascular system put in a different relation. I have seen the same practical point illustrated a hundred times in an equally striking manner, and I feel entirely safe in assuring you that you will do far better justice to your patient in all similar cases of inflammation, if you sacrifice a sufficient amount of blood by venesection when he comes under your care in the early period of the most acute stage, and in milder cases procure free evacuation of the bowels and give cardiac sedatives for a sufficient time to lessen the vascular tension before full anodyne doses of the opium are administered. The directions I have given you thus far relate to the management of acute pleurisy as it is met with usually, in the field of general practice; but there are some deviations from the ordinary class of cases which will require modification in the treatment. When the inflammation occurs in subjects previously in bad health, either from scrofulous, tuberculous or syphilitic influences, or constitutional impairment, there is much tendency to exudative material of a purulent character, which may fill the pleural cavity with a sero-purulent or purulent fluid, neither of which would be capable of absorption.

The occurrence of suppuration in the progress of pleuritic inflammation of an acute character is usually indicated by the occurrence of chills during the third, fourth or fifth days, followed by a brief exacerbation of fever and

copious sweating. These periods of sweating are apt to recur at irregular intervals. The patient loses strength and flesh rapidly, the pulse becomes soft, weak, quick, and we have all the physical signs of pretty rapidly increasing accumulation of fluid in the pleural cavity. The supervention of such symptoms should always lead to the suspicion of suppuration, and consequently either an entire pus accumulation in the pleural cavity constituting empyema or pyothorax, or an accumulation of a mixture of serum and pus, which in either case will not be absorbed or removed by any spontaneous process. Consequently it is in vain to lose time by the use of remedies calculated to promote absorption. It is not only in vain, but the delay thus occasioned greatly increases the risk of loss of life. Just as soon, therefore, as the evidences of accumulation are sufficient to indicate any considerable compression of the lung, the aspirator needle should be introduced for the purpose of making certain the diagnosis. If on withdrawing a small amount of the fluid, it is found to contain a large proportion of pus, the only safe practice is to freely aspirate what can be drawn off with the aspirator, and to enlarge the opening so as to allow judicious drainage, accompanied by the use of antiseptics, as you will find described in all your surgical works, for the treatment of empyema and other internal collections of pus. At the same time the patient must be supported by mild tonics, easily digestible nourishment, rest and pure air. Such measures, judiciously applied, will, in many cases, lead to the recovery of the patient. But in some, especially when complicated, as they are apt to be with tubercular deposits in the lungs, the recovery will be only partial. The patient will linger, in some cases, for many months in a feeble condition, while the disease in the lung tissues progresses through its successive stages, and aids materially to reduce the patient and hasten the fatal result.

The same remarks in regard to treatment are applicable to those cases of circumscribed pleuritis of a subacute character that are apt to recur, sometimes rapidly, in the progress of cases of tuberculosis in which the tubercular deposits are near the surface of the lung. Some of these are mild and will rapidly yield to the prompt use of anodynes, aided by the cautious use of cardiac sedatives, but will generally recur from time to time until they end in suppuration, frequently leading to a communication of the softened tubercular abscess in the lung through the pleural membrane so as to make a communication between the tuberculous abscess and the pleural cavity. In these cases free opening, drainage and antiseptics, with supporting measures internally, constitute the only means of palliating the condition of the patient and prolonging life. In some of this class of cases the communication between the suppurative cavities in the lung and the cavity of the pleura allows of the escape of air, and we get complicating what was otherwise a pyothorax or accumulation of pus, a pneumothorax, or accumulation of air, in the pleural cavity, giving, at the more dependent part of the affected side, dullness on percussion, and symptoms of accumulation of fluid, while we have tympanitic resonance from the presence of air above. Unless the accumulation of air and matter is so great as to threaten the life of the patient by the degree of compression, it is better, in most such cases, to palliate the patient's condition as much as possible by tonics, anodynes and rest, without attempting the more radical measure of incision and drainage on account of the possibility of making a communication between the air that enters the lungs and the exterior, a means of encouraging collapse and sudden death: although such results do not by any means always follow when the communication exists.

The treatment of chronic pleurisy may be summed up in a very few words. All that I have said in regard to the measures required for limiting the amount of effusion and exudation in the second stage of an acute attack, and for the subsequent removal of such effusion either by absorption or by aspiration in cases of moderate effusion, and free openings and drainage when the effusions are purulent, are equally applicable to the treatment of chronic pleurisy; the difference being mostly, that, in chronic cases the progress is slower, the accumulations take place much less rapidly, accompanied by little fever; and although the measures of relief are the same in kind so far as the administration of medicines is concerned, they require to be given with a less degree of energy.

LECTURE XLVI.

Phthisis Pulmonalis or Pulmonary Consumption—Its varieties—Their clinical history, Anatomical changes, Diagnosis, and Prognosis and Treatment.

GENTLEMEN: *Varieties.*—Under the head of phthisis pulmonalis, or wasting disease of the lungs, are included at the present time several diseases essentially distinct from each other in their origin and the causes which produce them, although leading to very nearly the same ultimate results. If we keep in view the different pathological conditions which give rise to those symptoms and lesions usually denominated consumption or phthisis pulmonalis, we shall find three distinct varieties of disease. First, those cases which are accompanied by primary deposits in the pulmonary tissues consisting either of small miliary granules, called miliary tubercles, of a grayish color, or of larger masses of a more yellow hue, and beginning insiduously without symptoms of an inflammatory character, and even with so little local feelings of irritation or annoyance to the patient that their existence is not suspected until considerable progress has been made. This variety of disease is properly styled pulmonary tuberculosis. The second variety includes those cases in which the deposits or accumulations in the lung tissue date their beginning either from pulmonary hemorrhage or more frequently from an attack of pneumonia. There is a class of patients not infrequently met with who are hereditarily predisposed to tuberculous or scrofulous disease, or having the predisposition acquired from circumstances relating to habits of life and sanitary conditions, who, although not having any deposits or change in the lung tissue at the time that they are attacked with acute pneumonia, nevertheless when thus attacked, the exudation which accompanies the pneumonic inflammation partaking of the abnormal properties belonging to the previous diathesis, fails to be disintegrated and removed by resolution on the subsidence of the inflammatory process. The exudative material which is thus left in the lung in such cases very generally, within a period ranging from three to four weeks to as many months, is found to be undergoing a deteriorative change called caseous degeneration. In the progress of this change, the patient begins to manifest quickness of pulse, increase of temperature

especially in the afternoon and evening, renewal of cough and often early supervention of night sweats. This class of cases are liable to run a more rapid course, both in the conversion of the caseous deposit into purulent material, and in the establishment of suppurative inflammatory action in the contiguous lung tissue, than the cases which are of a primary tuberculous origin, and we may distinguish them from the first by designating them caseous phthisis.

The other variety of disease generally included under the head of phthisis pulmonalis is strictly of a fibroid character; and generally, if not always, originates from primary capillary bronchitis. The capillary form of bronchitis in which the congestion, thickening and hardening of the lining membrane of the smaller bronchial ramifications is sufficient to close many of those tubes and to exclude the air from the alveoli or cluster of cells at their termini, causing the latter to collapse, thereby tends to diminish the capacity of the lung for air, and more or less to interfere with the movement of the blood in the capillary net-work surrounding the collapsed cells. This frequently leads to more or less exudation from the obstructed capillaries and increased irritability of the connective tissue of the lung, constituting a grade of inflammatory action, similar to that in the lining of the bronchioles, which constituted the original disease. At first the number of the alveoli thus deprived of air and collapsed may be small and lead to but little inconvenience. As this grade of bronchitis is generally renewed with every cold season of the year or exposure of the patient to cold and damp air, and as each renewal is liable to obstruct an additional number of the smaller bronchial ramifications, thereby increasing the number of collapsed cells and the amount of exudation and sclerosis of the connective tissue surrounding them, in the end, the whole side of the chest involved, or both sides if the bronchitis involves both lungs, becomes shrunken, and from the diminished amount of air, gives less resonance on percussion than natural, increased fremitus of voice, not infrequently hemorrhages and the establishment in the sclerosed connective tissue of a suppurative process, which causes a muco-purulent expectoration, general wasting of the flesh and strength, and the final establishment of hectic, night sweats, and all the phenomena of the advanced stage of phthisis, or consumptive disease.

In a preceding lecture, when discussing the different grades of bronchitis, their clinical history, pathological changes and treatment, I stated all that may be necessary in regard to this latter class of cases (see pp. 396-7), and in the lecture upon pneumonia and its results, I gave sufficient account of the symptoms and progress of the caseous form of phthisis. (See p. 433.) It remains, therefore, at the present hour, to direct your attention chiefly to the tubercular phthisis, as we have indicated, originating from the tubercular diathesis, either hereditary or acquired, and without any necessary connection with inflammatory attacks. The scrofulous and tuberculous diatheses, so far as regards their etiology, general symptoms, and the treatment which they require, both hygienic and medical I presented to you in sufficient detail when speaking of the chronic general diseases (see Lectures XXVII, XXVIII), and consequently I need not repeat with any degree of fullness the primary causes which lead, first, to the formation of the diathesis and the alteration of the constitutional condition, and secondly, to the establishment of local manifestations of disease in the form of caco-plastic deposits in the lungs. It is sufficient to recall your attention to the fact that when the diatheses, which are denominated scrofulous and tuberculous, are once established, there is a tendency to the development

of imperfectly elaborated material constituting imperfectly formed cells, granules, more or less amorphous matter, accompanied by certain inorganic material, and when these materials are thus elaborated in the system they appear to be incapable of disintegration and elimination as excretory matter on the one hand, and equally incapable of being added to any of the normal tissues of the body so as to form natural repair or growth. Being neither used to increase the growth of any natural tissue nor susceptible of elimination, the tendency is to find lodgment or deposit in some of the structures of the body. As a general rule they will be more likely to be found deposited in such structures as are most highly vascular, and at the same time subject to the greatest variations in the movement of the blood through the vascular tissue.

In very early childhood, while the brain is less mature in its development than most of the other organs, strong hereditary diatheses in this direction often result in the deposit of the granular tubercle in the membranes and periphery of the brain. A little later, anywhere between childhood and puberty, perhaps the greater tendency is to find lodgment in the lymphatic glands and adenoid structures of the body. From the period of puberty to the middle period of adult life, far the greater tendency is to find lodgment for this material in the pulmonary structure. And, as abundant clinical observation has shown, the deposition commences, in far the larger proportion of cases, at or near the apex of the lung. It may commence simultaneously upon both sides, or it may invade but one side first, subsequently involving the other, or it may attack but one side in any part of its course. Having already described sufficiently the symptoms, progress and diagnostic features of the tuberculous diathesis prior to the actual deposit of the tubercular materials, I will direct your attention at once to the symptoms and clinical history of the local development and progress of tubercular disease of the lung.

Symptoms.—A great majority of these cases are characterized during the first weeks, and sometimes months, of their progress by no other recognizable symptoms than a very gradual loss of flesh, diminution of color or increasing paleness, slight shortness of breath on active exercise or going quickly up stairs, slight increase in the frequency of the pulse in the afternoon and evening, and an increase of one or two degrees of temperature during the same periods of the day. These changes are so gradual in their development, give rise to so little inconvenience to the patient that they often attract from him no attention. But after a period varying from six weeks to six or eight months in some instances, an accidental exposure to cold and wet induces a mild attack of bronchitis accompanied by the usual symptoms of cough, soreness in the chest, slight fever and the ordinary characteristic expectoration. The patient and his friends regard it as a simple cold. It passes through its usual stages to the period when an ordinary bronchitis declines and disappears. But the cough, instead of disappearing, becomes less active and less frequent, and generally is restricted to the time that the patient rises from bed in the morning or first lies down at evening. The expectoration which had been the usual expectoration of moderate bronchitis begins to show more of a yellowish tinge, especially in the central part of the expectorated matter whenever deep coughing occurs or when the patient coughs freely after sleeping through the night. The soreness in the chest, that had characterized the attack of bronchitis, disappears.

But in addition to the continuance of cough, the patient gradually, from week to week, loses color and flesh, and becomes more conscious of some shortness of breath on active exercise. If the case is allowed to

take its own natural course, the cough will increase moderately from week to week, and the expectoration, especially in the morning, will become more and more of a purulent character, some portion, if not all, tending to sink in water. Not infrequently slight hemorrhages occur. The patient's appetite becomes less, bowels often incline to be costive, pulse in the morning soft, easily compressed, but little if any more frequent than natural, face and lips pale, but in the last half of the day and evening more color appears in the face, pulse becomes accelerated to ninety-five or a hundred in the minute, respirations a little more frequent than natural, but shorter and of less depth in proportion to their frequency. The patient somewhat troubled with cough on lying down, gets quiet after a little and usually sleeps without much disturbance till between four and six in the morning, when he awakes with increase of coughing and expectoration, and sometimes finds that during the last of his sleeping hours a general perspiration had supervened. Sometimes this morning paroxysm of coughing comes as early as three o'clock, and after lasting half or three quarters of an hour, the patient will fall asleep, and if left undisturbed may then rest till seven in the morning, when, on attempting to rise, he will suffer more paroxysms of coughing and expectoration of a purulent character.

These are the general symptoms which accompany the early stage of tuberculosis up to the time of what is denominated the commencement of the second stage of the disease. But if its progress is not interfered with, from this time the symptoms I have last described consisting of paleness, weakness, languor and low temperature in the morning, followed by flush of the cheeks, increased temperature, acceleration of pulse, shorter and more frequent respiration, with steadily increasing emaciation and diminution of strength, will continue with accelerated pace from week to week and from month to month. At the same time the expectoration increases in quantity, and a larger proportion of it is of a purulent character, sometimes mixed with a little blood. The patient may have hemorrhages of a greater or less amount of clear blood, unmixed with mucus or matter, at any part of this or the preceding stage; and the occurrence of night sweats usually becomes more frequent and copious, till at the end of from three to six months, as an average, the patient is obliged to forego further exercise and take to his bed, or at least to his room. The subsequent history is simply a continuance of the prominent symptoms of emaciation, hectic fever, night sweats, often accompanied after awhile by entire loss of appetite, the occurrence of apthous ulcerations in the mouth and fauces, short frequent turns of diarrhœa generally without griping or pain, more rapid exhaustion, cold extremities, loss of voice, or feebleness of articulation, extremely rapid and weak pulse, breathing short, hurried, imperfectly inflating the lungs, and finally collapse and death—the history covering a period of time varying from six months to two or three years. You will notice from the history I have given you that the clinical progress of the disease may be divided into three stages. The first is that of simple crude tubercular deposit, occasioning but slight symptoms of any local trouble, and varies in its duration from four weeks to double that number of months.

The commencement of the second stage is marked by evidences of increased inflammatory action and hyperæmia in the lung, causing more cough, temporary periods of soreness in the chest, acceleration of pulse, and more expectoration. The supervention of the symptoms are usually attributed by the patient to taking cold and if they are mitigated by treatment for a time they are renewed; and each renewal will be attrib-

uted as the first to some accidental cause, but generally they are owing merely to the natural progress of the disease in the lung. This second stage, commencing as I have indicated, continues till the suppurative process, softening of the tubercular masses, and establishment of the suppurative process in the contiguous lung tissue is complete; as indicated by decided purulent expectoration, hectic fever and night sweats. This second stage pathologically is the stage of softening disintegration of the tubercular masses, and the establishment of the suppurative process. The third stage commences with the completion of this suppurative process, the excavation of one or more tuberculous cavities, and well marked hectic fever. Thus far I have given you only the subjective symptoms that accompany the progress of the disease and, although in most cases sufficient by themselves to render the diagnosis reasonably certain, they should never be relied upon to the neglect of physical examination of the chest. In the first stage, that of primary tuberculosis of the lung, inspection of the chest will usually show some degree of flattening in the infra-clavicular region or lessening of the antero-posterior diameter of the upper part of the chest. This, in the very early stage, is often hardly perceptible. But if the tubercular deposits have continued even in an entirely latent condition for a few months, this change is almost always easily observable on inspection, and is made still more apparent by stretching a tape line from the most prominent part of the clavicle to the nipple, which will show a receding or flattening, from the fact that the skin over the second and third ribs will not reach the tape line, but fall from it enough to indicate a concavity, where there should be a convexity of the chest. When the tubercular deposit exists in only one lung the contrast between the affected side in this respect and the other is usually well marked.

Percussion carefully practiced in such manner as to elicit the tone of sound distinctly and clearly, will, in almost all cases, indicate an appreciable diminution in the resonance of the affected side of the chest, in the infra-clavicular space. In cases where the tubercular deposit is small or diffused through a considerable portion of the upper lobe of the lung, the diminution of the resonance may be so slight as to leave you in doubt as to whether it is less than natural. But, even in those cases, if in addition to testing the resonance carefully by percussion, you examine the degree of fremitus of voice with the aid of a double tube stethoscope you will be able to detect increased fremitus or vibration through the walls of the chest sufficiently to corroborate even the slightest diminution of resonance by percussion. Of course, the more the deposit accumulates in the lung, the greater will be the fremitus and the less will be the resonance. Auscultation in this first or primary stage of tuberculosis seldom gives to the ear any new sounds or rales, but simply modifications of the natural respiratory or vesicular murmur. These modifications of the natural murmur consist chiefly in altering the uniformity of the inspiratory sound, rendering it often irregular in its development, and causing a renewal of the murmur in each expiratory act. In some instances the change consists in simply shortening and rendering the natural murmur deficient. On the other hand, when the mass of tubercular deposit is larger, the sounds transmitted through the condensed pulmonary tissue will be increased above the natural intensity, and not infrequently present the quality that is called tubular. The physical signs of the first stage of tuberculosis, therefore, are not the production of new sounds, but simply alteration of the natural respiratory murmur, increased fremitus of voice and diminished resonance on percussion.

These physical signs, taken by themselves, do not prove the existence of tuberculosis, they simply prove the existence of something which has diminished the amount of air in the lung under examination, and thereby rendered its structure more dense. Whether that density is from tubercular deposit, pneumonic exudation, pulmonary œdema, or compression from pleuritic effusion, must be determined by the history of the case, and the associate general symptoms, as we shall see when we come to speak more particularly of diagnosis. In the second stage of tuberculosis, auscultation still gives alterations in the respiratory murmur, especially that which consists in irregularity in the development of inspiratory sound, or its renewal in expiration, and usually there are added more or less moist râles. At first these râles will be movable, caused by mucus accumulating more or less in the bronchial tubes and the passage of air to and fro through it. The râles consequently will differ much in the amount present or absent at any particular moment, depending upon the fact as to whether the patient had been long without coughing and clearing the air passages, or had just before the examination, by such act, removed what mucus had accumulated. But as the second stage progresses and the tubercular mass becomes softened and the surrounding lung tissue filled partially by a low grade of pneumonic engorgement, a submucous râle is developed of a more fixed character, that is not removed temporarily by the act of coughing, but is developed regularly near the end of each moderate attempt at inspiration; showing that it depends upon the entrance of air into texture filled more or less with a viscid fluid.

It is especially distinctive of the early stage of suppurative softening in the progress of tubercular diseases. While auscultation reveals these changes in the second stage of the disease, percussion elicits a greater degree of dullness than in the first stage, and there is also a corresponding increased vibration of voice, making what was slight and perhaps a little obscure in the first stage, plain and unmistakable in the second. In the third stage of the disease, when the suppurative process is complete, when some of the abscesses now in the lung are evacuated, forming the commencement of suppurative cavities, auscultation still will reveal a fixed moist râle that sounds still more like forcing air into a porous body filled with a viscid fluid, accompanied by an occasional drop, as though two surfaces moistened with thick fluid had been separated from each other. Over these places the voice now instead of giving simple fremitus or increased vibration gives more or less distinct pectoriloquy or direct transmission of the voice into the ear or funnel of the stethoscope. Percussion over most of the affected part of the lung will still be decidedly dull. If, however, cavities have formed near the surface of the lung it will sometimes happen that directly over the cavity, instead of dullness, there will be a modified tympanitic resonance. This is only when the cavity is large and near the surface. In other instances the cavity thus formed and communicating by a pretty free opening with one of the larger bronchial tubes, will yield on percussion directly over it, not a tympanitic resonance, but a peculiar sound denominated "*Bruit du pôt fêlé*," or cracked metal sound.

These are the physical signs which characterize the advanced or complete suppurative stage of tuberculosis. They are almost always most marked in the upper part of the chest. Rare cases occur, however, in which the tubercular deposits have taken place in the middle lobe of the lungs, and still rarer instances where they have been found to commence in the lower lobes and to produce the same successive changes in the gen-

eral symptoms and physical signs as I have described, except that the sinking or flattening of the chest at the upper part would not be noticeable so much as the parallel changes in the middle and lower portions.

I have thus traced the symptoms and physical signs of the different stages of tubercular disease with sufficient minuteness to give you a fair outline of its progress. There are some individual symptoms, however, to which it may be well to refer a little more in detail. Chief among these are hemorrhages. Hemorrhage as a symptom of tuberculosis is of importance, both in its effects upon the patient and as an aid to diagnosis. So far as my observation goes, pulmonary hemorrhage is of very rare occurrence disconnected from prior tubercular deposit. I am well aware that Niemeyer and some other recent writers, claim that pulmonary hemorrhage not infrequently precedes tubercular deposit, and is the cause of such deposit instead of being always secondary. These writers claim that the hemorrhage is liable to occur without being preceded by any mechanical impediments from tubercular deposits, and when the hemorrhage takes place, more or less of the blood extravasates into the interstitial spaces of the tissue and part of it fails to be disintegrated and removed by absorption. Remaining, it undergoes caseous degeneration associated with more or less inflammatory congestion of the surrounding pulmonary tissue. These primary deposits soon change still further into a purulent condition, and the hyperæmia of the surrounding tissue assumes the form of suppurative inflammation, thus giving you all the phenomena of a tubercular development in the second stage of its progress. I must acknowledge, that through a long period of observation, with the attention, during the later years, directed to this particular point, I have not been able to satisfy myself that a single case has come under my observation in which the hemorrhage preceded evidences of more or less tubercular deposit. And I am strongly inclined to think, that if such cases occur, they are extremely rare, and that the occurrence of hemorrhage without any traumatic lesion or other special known cause, spontaneously proceeding from the pulmonary tissue, constitutes very strong presumptive evidence of latent tubercular disease. I have yet to find a patient whose subsequent history did not corroborate the position that hemorrhage is secondary and not primary to the tubercular formation.

There are three pathological conditions connected with tuberculosis, that give rise to hemorrhage. The first would appear to be simply obstruction of the capillary or smaller blood vessels by the mechanical pressure of a primary tubercular deposit, damming the blood and causing the coats of the engorged vessels to rupture, thus allowing the blood to escape into the air cells and alveoli, from these through the bronchial ramifications to appear in the expectoration. Hemorrhage from this pathological condition usually takes place early in the progress of the tubercular disease, and is quite as apt to occur when the patient is entirely at rest, occasionally waking him from sleep in the night. Sometimes it appears while he is sitting at ease, at others while walking or standing, and not infrequently it is the first symptom that alarms the patient and creates the suspicion that he has serious ailment. In most instances the quantity of blood lost is slight. It may be but a single mouthful, but in rarer instances it may come up mouthful after mouthful as fast as the patient is capable of spitting it out, with but little effort at coughing, till from two to four or six ounces are lost. Very much more frequently, however, the quantity will not exceed two or three drachms.

The second pathological condition liable to give rise to hemorrhage

usually develops with the early part of the second stage of the tubercular disease, when the tissues surrounding the tubercular deposit first begin to take on inflammatory action and the vessels become engorged with blood or hyperæmic. It not infrequently happens that at this stage some of the vessels immediately surrounding the tubercular mass have become weakened by more or less degeneration of the connective tissue entering into their coats. Consequently with the accumulation of blood at this stage the weaker points of the vessel yield to the distension and allow more or less escape of blood, and consequently of hemorrhage similar to that I have already described. These turns of hemorrhage also usually come without any special cause or physical exercise on the part of the patient. The hemorrhage may be but a single one that marks this stage, or the escape of blood may take place rapidly at short intervals lasting through three or four days at a time and be renewed again in one or two weeks, or it may occur but once in the whole progress of the case. The third pathological condition liable to give rise to hemorrhage is the impairment and destruction of vessels in connection with the completion of the suppurative stage and the formation of suppurative cavities in the lung. Hemorrhages at this stage are not so frequent as at either of the other stages mentioned; but when it does occur it is liable to be much more copious and sometimes by its quantity and the previously debilitated condition of the patient directly induces a dangerous degree of exhaustion. It is rare that it induces a direct and positively fatal result; yet it adds so much to the exhaustion, and is liable to be repeated, in some instances, at such short intervals that it results in bringing on complete collapse and death. The hemorrhages which occur in the first and second stages of tuberculosis, when moderate in amount, not infrequently leave the patient feeling more comfortable and free from oppression than he was for several days before the hemorrhage occurred. But in the majority of instances hemorrhages, whether slight or more copious, not only greatly alarm the patient and the friends, creating a mental anxiety that of itself is depressing to the patient and calculated to hasten the further development of the disease, but they are usually followed by some degree of increase of all the more important symptoms. Another symptom which needs perhaps an additional word of explanation is that of indigestion. A large proportion of tubercular patients complain but little of the digestive organs, but you will meet here and there one, who from an early stage of the disease has suffered from loss of appetite, sense of heaviness in the epigastrium followed by gaseous and sometimes acid eructations during the next two hours after taking food.

The gastric symptoms often occasion more suffering to the patient and occupy more of his attention than any of the symptoms belonging to the pulmonary disease. This deprives the patient of good assimilation and nutrition and usually increases the rapidity of his failure in flesh and strength, and by exhausting the nutritive elements of the blood leads to an earlier supervention of the second and third stages of the pulmonary disease. Another symptom which rarely occurs in the early stage, but which is occasionally met with, is diarrhœa. From the beginning of the patient's failure in health before attention has been directed to the pulmonary disease by any marked symptoms, a chronic persistent form of diarrhœa, consisting of from one to five and six thin serous discharges from the bowels, usually accompanied by little or no pain, but only a sense of weakness or exhaustion, will come on insidiously without any apparent cause and sometimes without either impairment of the appetite or that part of digestion which takes place in the stomach itself. In many

of these cases the diarrhœal discharges are confined almost entirely to the morning, commencing when the patient first rises from bed, and being repeated from two to four times during the next two hours and then ceasing for the remainder of the day. In other cases the discharge will take place within from a quarter of an hour to an hour after each meal; the presence of food in the stomach not occasioning pain or symptoms of indigestion, but simply exciting increased peristaltic motion of the bowels, until it ends in a discharge of thin fæces, sometimes a second discharge following in a little time, and then the alimentary canal becomes quiet until after the next meal. Such patients seldom have more than a very slight tendency to cough, so slight and so little of associate symptoms referable to the chest, that the condition of the lungs is entirely overlooked and the whole difficulty is regarded as intestinal catarrh, in modern phraseology, or slight inflammation of the mucous membrane of the ileum, or perhaps some portion of the colon, but chiefly of the lower portion of the small intestine. Remedies that are given to overcome this condition always temporarily relieve the patient, but the relief uniformly proves only temporary, and the difficulty speedily returns.

In this way several months may be passed, the patient on the whole gradually losing flesh and strength, until he is unfit for work and obliged to keep his house. If at any time during the progress of the disease suspicion is aroused in regard to the lungs, and a closer examination is made by auscultation and percussion, the evidences of diffuse miliary tubercular deposit will almost always be recognizable in the upper part of one or both lungs. The true explanation of these cases is found in the deposit of the gray miliary tubercle in the follicles and glandular structures of the mucous membrane of the ileum, simultaneously with their deposit in the lungs. The deposits in the intestinal follicles soon cause a low grade of inflammatory action around them, causing the first appearance of the diarrhœal discharges. This is soon followed by softening and disintegration of the tubercular granules and their disappearance in the evacuations, while numerous small but irregular ulcerations are left in their place. The progress of the disease in the intestines apparently diverts more or less of the nervous sensibility from the pulmonary tissue, and lessens the active ordinary symptoms of local disease of the lungs. Yet in some cases while the ordinary symptoms of the progress of local disease in the lungs are almost entirely absent, the deposit in the lungs undergoes its ordinary natural changes and will be found in an advanced stage of progress when the patient is apparently dying from the exhausting influence of protracted diarrhœa and intestinal ulceration, as may be proved by the careful practice of auscultation and percussion. These intestinal complications with tuberculosis need careful examination on account of their liability to lead the practitioner astray in his early diagnosis, and cause him to give assurances to his patient in regard to recovery that are delusive; and although it may not alter in any degree the progress of the disease, yet such false assurances in regard to the nature of the case and the prospect of recovery, always shake the confidence of the patient and his friends in the competency of the physician, and not infrequently cause his dismissal from further care of the patient. Consequently whenever chronic diarrhœa shows itself without an apparent cause, proves persistent and recurs after temporary relief from ordinary remedies, you should suspect some latent, unexplained disease, and give the patient a full examination, including especially physical exploration of the chest. This condition should lead you not only to make a direct physical exploration, but also a careful inquiry into the family history and

tendencies as regards any hereditary influence in the direction of scrofula or tuberculosis. There are features of these cases, if they are examined into as carefully as possible, that will reveal to the practitioner such a history and tendencies as will leave no doubt concerning the true nature of the case. The diarrhœa I have already mentioned is apt to supervene in the last stage of exhaustion, resulting from any form of chronic wasting disease.

Anatomical Changes.—The anatomical or structural changes which constitute the commencement of the early stage of tuberculosis, consist in the accumulation, in some portion of the pulmonary structure, of small aggregations or masses of organic matter which, when examined under the microscope, are found to be composed of imperfectly formed cells, granules, nuclei, some amorphous hyaline matter, and inorganic material, chiefly compounds of lime, and more or less of fat granules. These constituents of the tubercle appear to be derived either from imperfect cell growth in processes of assimilation, or from the imperfect disintegration of cell structure in the natural processes of waste. Many of the earlier investigators regarded the tubercular masses as a result of previous inflammatory engorgement and exudations. But there is not sufficient evidence that inflammatory processes have any necessary connection with the origin and deposit of tubercles. As I have shown when speaking of the constitutional conditions constituting the scrofulous and tuberculous diatheses, there is in almost, if not all cases, a stage of impairment in the properties or forces which govern the molecular movements in the tissues, constituting nutrition and disintegration, existing prior to the local development of the tubercular formations. And as these constitutional conditions are induced by causes acting with feeble intensity through considerable periods of time, and the local development of tubercle only supervenes after these general impairments have reached a considerable degree of development, I have every reason to suppose that they are simply the product, as before stated, of imperfect elaboration of material, and by its failure to be eliminated through the excretory organs, it assumes the form of genuine deposit in the structure. The precise location of the deposit varies. In some cases it appears in the interstitial spaces of the connective tissue, in other instances in the alveoli or air cells, and not infrequently in both. In uncomplicated tuberculization, the morbid material commences as small granular masses, most frequently of a grayish color. These masses appear to increase in size by accretions to their growth, until when examined in an advanced stage of the disease, they may be found of all sizes, from a millet seed to that of a hickory nut.

The changes which these masses undergo during the progress of the disease appear to be that of degeneration of the more elaborated portion of the material converting the imperfect cells and nuclei into a more yellow caseous substance, and still later into pus. These changes appear to progress faster in the center of the tubercular masses than toward their periphery; giving them, when laid open for examination, a yellowish, friable appearance, softer in the center than toward the circumference. As the lung tissue becomes congested and a low grade of inflammatory action is set up around the larger deposits, this apparent degeneration and softening goes on through the whole mass, until it becomes converted into a mixture of granular or cheesy material and pus. These ingredients of the softened tubercles may be often detected in the sputa of patients during the second stage of the disease.

Several years since some of the European investigators, through experiments in inoculating tuberculous matter into small animals, as rabbits and

guinea pigs, claimed to have demonstrated that the disease was capable of transmission by inoculation. And, hence the conclusion was reached that tuberculosis was an infectious if not a directly contagious disease. More recently, however, it has been so clearly shown that inoculation of these animals with any other inflammatory product or even with organic matter derived from saliva, would result in similar deterioration of the animals and apparent tubercular deposit, that no reliance can be placed upon the deductions from these earlier experiments. Very recently Koch has discovered in the tubercular mass in the lungs and more readily also in the matter of expectoration, an organic germ styled "bacillus tuberculosis," which he claims to be peculiar to this form of disease. He regards it as the essential cause of the disease. His observations have been confirmed by several other eminent microscopists, and have been either denied or modified by many others. That the bacilli or minute organisms may be found in the sputa there can be no doubt. The conclusion, however, that these minute organisms are the essential cause of tuberculosis, and that the tubercular deposits, with all the subsequent changes, start from inoculation of these bodies either inhaled through the lungs or in any other manner introduced into the system, has been altogether too hastily drawn. Before this conclusion can be considered as established it must be demonstrated by a sufficient number of examinations, that these identical organic germs exist in all tubercular deposits; not only in those that are undergoing softening disintegration and from which matter of expectoration is furnished, but in the primary tubercular masses in the lungs, in the mesenteric glands, and in other lymphatic or adenoid structures in different parts of the body. Some examinations of the tubercular material in the mesenteric glands have been very recently made without detecting these organisms. And it is more than probable, in my own estimation, that mature investigation in the early stage will lead to the final conclusion that the bacillus tuberculosis is only an accompaniment of the degenerative changes in the tubercular masses wherever found, thereby destroying the idea of their causative influence or of their playing an essential part in the propagation of the disease.

Beside the formation of tubercular deposits and their transition from the imperfectly elaborated organic material of which they are composed into purulent material in the advanced stages of the disease, the pathological changes in the lung tissue, immediately surrounding the tubercular masses, is of much importance. These changes in the lung structure are strictly analogous to and probably identical with a low grade of pneumonic inflammation. There is every appearance of a stage of engorgement in the vessels surrounding these masses. Engorgement is followed by exudation into the interstitial spaces of the tissue, causing increased density of the structure to such a degree as to increase the fremitus of voice and diminish the resonance on percussion, and to cause the greater part of the febrile phenomena accompanying the second stage of the disease. It is the accumulation of true inflammatory exudative products in different stages of progress that gives to the tuberculated portion of the lung its varying degrees of density, and not infrequently, on post mortem examinations, a close resemblance to the gray hepatization of the suppurative stage of uncomplicated pneumonia. As the separate tubercular masses are in most cases very numerous, and as the changes they undergo usually take place in the order in which they were deposited, the earlier deposits generally mature and pass into the second stage or that of softening, while other

deposits are just being formed; thus presenting in its progress a succession of pathological changes, corresponding with the exacerbations and remissions that characterize the general symptoms and progress of most of the cases of tubercular phthisis.

The same circumstances explain why, on post mortem examination, in laying open the tuberculated lung, you will often find all these changes present within the compass of a single lobe. And this explains why so often in the progress of this form of disease, the patient for a time progresses unfavorably with steadily increasing emaciation, rapid pulse, copious expectoration, night sweats, and yet, after a time begins to improve; all the symptoms and the quantity of the expectoration gradually diminishing until he is flattered with the expectation of recovery, when without any real or apparent cause he begins again to have some increase of inflammatory or febrile symptoms, ending in a similar copious expectoration and a little further progress in emaciation and loss of strength than before. They thus undergo a succession of exacerbations lasting two, three or four weeks with intervals of moderate improvement perhaps of a similar length of time, which improvement raises new hopes and causes the patient and his friends to insist that they are recovering, only, however, to be disappointed with the development of suppurative action in the next series of deposits.

LECTURE XLVII.

Phthisis Pulmonalis Continued—Its Diagnosis, Prognosis and Treatment.

GENTLEMEN: In regard to the diagnosis of genuine tubercular phthisis little more need be said than to recall your attention to the physical signs I have already mentioned when describing the progress of the disease, and their comparison with the presence or absence of physical signs in the diseases with which tuberculosis is most apt to be confounded. Indeed, there is but one form of disease that presents any apparent difficulties in its differentiation from the earlier stage of the tubercular deposit and that is bronchitis. The clinical history of bronchitis and the development of tubercular phthisis, are sufficiently distinct in their general features, when carefully examined, to enable the practitioner reliably to separate the one from the other, but from many patients it is impossible to get an accurate history of their case, such as is needed to form reliable conclusions, consequently the physical signs derived from auscultation and percussion become not only important but necessary to enable us to distinguish tubercular deposits, especially when of very limited extent, from any form of bronchial disease. There is no form or stage of the latter, which will give rise to diminished resonance on percussion, increased fremitus of voice, and simple alterations of the natural respiratory murmur. If there is any exception to this rule, it is in those cases of chronic capillary bronchitis which have resulted in the occlusion or closing up of a sufficient number of the bronchioles, to allow such a degree of collapse of the alveoli as to contract the chest and alter

its resonance from the diminished capacity for air in consequence of such contraction. This stage of bronchitis, however, is preceded by a history so characteristic of the disease, and the contractions so generally affect the middle and lower parts of the chest, as much or more than the upper, and are therefore so different from the flattening of the infra-clavicular region of the chest antero-posteriorly at its apex or upper part, that the one can hardly be confounded with the other. Consequently, you are safe in deciding that there are deposits of some kind in the lung tissue and probably of a tuberculous character whenever accurate percussion in the infra-clavicular region elicits less than the normal resonance, and the voice gives increased fremitus or vibration through the walls of the chest, and the respiratory murmur is altered either by irregularity of development, prolongation, renewal in expiration or deficiency. If to these physical signs, is added distinct flattening as determined either by measurement or inspection, you have all the evidences that are needed to show, not only that there is increased density of the lung from some cause, but that such density is the product of tubercular accumulations.

For while exudations from pneumonic inflammation may give rise to increased dullness on percussion and fremitus of voice, they are necessarily accompanied by the other phenomena of pneumonic disease, such as the characteristic expectoration, the phenomena of a general fever and are preceded by a history that dates comparatively but a few days back, for its beginning. Pulmonary œdema may also give rise to diminished resonance and increased fremitus of voice, but such œdema will not cause shrinking of the chest, and can result only from some prior disease, such as organic or structural lesions of the heart, structural diseases of the kidney, or other conditions tending to produce general dropsy. An exception may be met with in some instances of capillary bronchitis in children and in old persons in which the extreme dyspnœa causes want of oxygenation and decarbonization of the blood, and by thus secondarily impairing the vaso-motor influence over the pulmonary vessels, a degree of œdematous infiltration may take place in the pulmonary tissue, thereby inducing the physical signs I have named without the existence of any tubercular deposits. But here also there is a preceding history of capillary bronchitis, or of general dropsy from either renal or cardiac disease, which differs very much from that of any stage of tuberculosis.

Pleuritic effusion sufficient to compress the lung may cause increased dullness on percussion and alter the fremitus or vibration of voice, but it will neither cause flattening of the infra-clavicular spaces nor diminution of the chest artero-posteriorly, but will cause greater changes in the middle, lower and lateral parts of the chest, and will be preceded by such a clinical history as points distinctly to pleuritic inflammation and its consequences instead of tuberculosis. Therefore, if you are careful to first ascertain clearly the results of physical exploration by inspection, auscultation, and percussion, and before drawing your final conclusion, compare these results with a careful study of the preceding history of each patient with the present general symptoms, you can hardly fail to distinguish even the earliest stage of tubercular deposits from any of the other pathological conditions with which it is liable to be confounded. I call your attention to the diagnosis of this stage more particularly, because of its great importance: it being the stage in which, with proper management, there is a reasonable chance for the patient's recovery. In the subsequent stages of tuberculosis, the diagnosis is still more easily made. With the increased accumulation of deposits, increased contraction of the upper part of the chest, more or less condensation of the lung

tissue surrounding the tubercular masses, the dullness on percussion and increased vibration of voice become still more plain and easily recognized; and with the beginning of softening, come always more or less of sub-mucous or mucous râles, fixed in the tissue or only partially removable temporarily by coughing. The expectoration itself, now, if properly examined, may aid in confirming the diagnosis.

In many cases, when softening has made considerable progress, the microscope will reveal more or less of the broken cells, nuclei, and granular material that constitute the tubercular mass. Not infrequently may be detected, also, with close scrutiny, the fragments of the connective tissue of the lung. These, with more or less of pus globules, may be regarded as additional evidence that the expectorated matter is derived from softening and disintegration of tubercle, and not from any suppurative condition of the bronchial membrane. How far the detection of the bacillus in such expectoration is to be regarded as surely and positively distinctive of the expectoration from the tubercular mass remains yet to be determined. That it exists in a great number of the cases of this kind of expectoration there is no doubt; but the investigation must be carried to the extent of making similar microscopic examinations with the same degree of minuteness in the muco-purulent matter derived from the second and third stages of bronchial inflammation, and also the expectoration that occurs in the second stage of pneumonia when diffuse suppuration exists, before any positive conclusions can be reached. There is nothing yet on record indicating that these investigations have been made, and before we can conclude that the bacillus of Koch is distinctive of expectoration from pulmonary tubercle, all these other forms of expectoration must be examined with the same care as though each came from a well-marked case of phthisis. In the second stage of tuberculosis, as I have already stated, the diagnostic features are, the increased dullness on percussion, increased vibration of voice, more or less moist râles, varying much at different times according to the degree of softening and condensation of lung tissue, and the character and composition of the sputa. In the third stage of the disease, after suppuration in some portions of the lung has been completed and cavities have been formed, auscultation frequently reveals, not merely fremitus of voice, but that concentrated transmission of the voice directly to the ear or funnel of the stethoscope, which is called pectoriloquy; while percussion over most of the affected lung will still yield only marked dullness, yet whenever there is a cavity of considerable size near the surface of the lung, percussion may elicit a degree of tympanitic resonance over a very limited area, the surrounding parts being dull. Or, if a large cavity has a free communication with a bronchial tube, percussion over it will not unfrequently elicit that peculiar sound denominated "bruit du pôt fêlé," or cracked metal sound. It is thus, gentlemen, that by means of the faithful practice of auscultation, percussion, and the additional modes of physical examination, you may not only diagnosticate accurately tubercular disease in all its stages, but you may define accurately its extent or degree of diffusion through the lung tissue, and very nearly the exact stage of advancement it has made up to that of extreme exhaustion of your patient and the approach of death.

Prognosis.—In regard to prognosis much will depend upon the age of the patient and the circumstances which have led to the development of the disease. As a general rule, cases of a strictly hereditary character are less likely to be arrested in their course or be rendered abortive by any process of treatment than those which have originated *de novo* with the individual. And yet if the diagnosis has been made early, while the

tubercular deposits are small and comparatively few in number, and the patient under thirty years of age, there is a possibility of arresting the further progress of tubercle formation and causing that which already exists to remain latent or slowly diminish. That primary crude tubercular deposit is capable of undergoing arrest in its growth or increase, and of having its organic material slowly undergo disintegration and disappearance by absorption, leaving only a small speck of inorganic matter in the lung, we have abundant evidence furnished by post mortem examination after death from other diseases, in subjects who had at a previous period been known to be tuberculous. Not only may we make a favorable prognosis in many of the cases that come under observation in the early stage, but, in cases that are further advanced, even in the stage of softening or suppuration, if on careful examination the structural changes are found to be limited to the apex of one lung, and the patient capable of availing himself of the most favorable circumstances for controlling the disease. Under such circumstances assurance may be given that there is a reasonable chance of recovery; not by arresting the progress of pathological changes in the affected part of the lung, but by sustaining the strength and nutrition of the patient until the disintegrated tubercular mass has disappeared by expectoration and the resulting cavity filled and cicatrized by the ordinary process of repair. This result may leave the upper part of that side of the chest more or less contracted and a moderate diminution of capacity for air as a permanent change, and yet the general health will be restored and may remain sufficiently good to admit of an active life during an indefinite period of time, or until destroyed by other forms of disease. But if the deposit occupies more or less of both lungs, or if one lung has several places advanced to the second or softening and disintegrative stage, the chances of any permanent recovery are exceedingly small. Judicious management may greatly retard the progress of the disease under such circumstances, and render the patient more comfortable, but it is very rare that it will do more than this. As a large proportion of all the tubercular patients neglect to seek thorough examination and advice till the second stage has actually begun, so it is that almost all those that thus come under observation force us to an unfavorable prognosis, which is only too surely verified by their ultimate failure and death from the subsequent progress of the disease.

Treatment.—The management of the diathesis or constitutional condition which exists prior to the deposit of tubercle in the lungs, at least in the large majority of cases, was considered sufficiently in detail, both in regard to hygienic measure and the administration of remedial agents in the lectures on the general pathology of the chronic constitutional diseases, and in that in reference to scrofula.* Consequently I shall here consider the treatment only as it relates to pulmonary tuberculosis after the commencement of the deposits. In the first stage of pulmonary tuberculosis, there are three distinct indications to be fulfilled or objects to be accomplished in its management; first, to so change the functions of nutrition and disintegration as to prevent the further development of the tubercular material in the system; second, to render the deposits already existing abortive in their further progress; third, to correct such defects in the conformation of the chest, or in the constitutional condition of the patient as may have supervened during this first stage. Keeping in mind the fact that tubercular material may be derived, either through defects in the

* See Lectures XXVII and XXVIII.

processes of disintegration and elimination, or through imperfection in the processes of assimilation and the appropriation of new material to the tissues, it is evident that the management of cases belonging to the one class may require measures essentially different from those of the other. As explained when speaking of the etiology of the disease, those cases which originate from hereditary influences belong to the class in which the primary fault is in the assimilation of new material, while in a large proportion of the cases in which the diathesis has been acquired without hereditary influence, it has resulted from exposure to such causes as interfere primarily with the oxygenation and decarbonization of the blood and secondly with disintegration and excretion.

To arrest the progress of further development of tubercle in the first stage, such measures should be instituted as are calculated especially to supply the patient with such a variety of food as will furnish all the material necessary for the nutrition of the various structures of the body; such an amount of pure, fresh air as will secure full oxygenation and decarbonization of the blood; and that degree of daily, habitual, muscular exercise, including especially the muscles of the chest, the trunk of the body and upper extremities, as is calculated to promote muscular nutrition and growth, and at the same time to increase the efficiency of the expansion of the chest. In many of these cases, if the circumstances of the patient will allow them, when properly directed, to secure all the influences necessary, including food, clothing, air and exercise, they may recover without a change of climate. But you will find a proportion of the cases, especially patients between the ages of puberty and twenty-five years, whose growth has been unequal so that the chest is narrow in proportion to their height, lacking capacity for air, whose nutrition is defective as exhibited by a delicate, spare condition of all the tissues. In such, a judicious change of climate is almost an absolute necessity to secure success. The change needed for this particular class, is to an elevation, ranging between twenty-five hundred and five thousand feet, with a dry, mild condition of the atmosphere, if possible upon a dry soil with an acclivity to the south or east. Such an elevation of itself causes unconsciously increased frequency and force of respiration, to compensate for the increased rarity of the atmosphere. If the patient is kept much in the open air with moderate daily exercise, as should be the case, this unconscious and continuous increase of the respiratory movements leads to a steady increase in the expansion and capacity of the chest. And, if the patient is at the same time supplied with the necessary quantity and quality of food, there is a reasonable certainty that a continuous residence in such a locality through a period of one, two or three years will secure a fair respiratory capacity, with a shrinking of the tubercular deposits already existing or their conversion into small calcareous atoms thus rendering them abortive, and thereby accomplishing the second object of treatment at the same time with the first.

In this class of cases, through the first stage of the disease, comparatively little can be accomplished by the administration of medicines. I have thought in some instances during the early part of the treatment and especiably when patients were not able to avail themselves of the advantage of a change of climate, that the long continued use of such remedies as the lacto-phosphate of calcium in the form of syrup, or the syrup of iodide of calcium produced decided benefit. The addition of a tablespoonful of cod-liver oil twice a day, if these patients, on trial, find they can digest it without annoyance to the stomach, will increase the benefit, and add materially to the activity of nutrition and consequently aid in

arresting the further accumulation of tubercular material. The calcium compounds I regard as of more value than is generally supposed. Evidently, one of the defects in the nutrition favoring tubercular developments is imperfect cell-growth. Long continued clinical observation has led me to the conclusion that the compounds of phosphorus and calcium in such forms as the lacto-phosphate of calcium, and iodide of calcium have a positive influence in promoting cell-growth and consequently of increasing the perfection of the nutritive processes. As a general rule almost any remedial agent or nutritive material that will increase the efficiency of nutrition will be beneficial to such patients. But it is not to their advantage to be overdosed with medicines, more particularly with those that are calculated either to diminish the appetite for wholesome food, or the power to assimilate it.

The class of tuberculous patients who come under our care in the first stage of the disease, in whom the tubercular diathesis has been created without hereditary influences, by living in damp, ill ventilated rooms, confined too closely to indoor occupations and all those modes of living by which the functions of disintegration and elimination are more or less impaired, are as much benefited by the same rule in regard to well regulated exercise in the open air, the selection of a diet containing the necessary variety and quality of material for healthy nutrition, and change of climate in the same direction, as the class of patients to which I have already referred. But, experience has shown that many of this class of cases, when they first come under observation, have special functional derangements of the digestive organs, such as defective secretion of gastric juice, an inactive condition of the bowels, not infrequently defective secretion of urine, a dry and unhealthy state of the cutaneous surface, and they will be greatly benefited by giving special attention to the removal of these various functional disturbances. It is true that good food, warm clothing and well regulated exercise in the open air will do much to correct these, without medication. But it is equally true that the judicious administration of such remedies as will promote better secretion of gastric juice, secure the daily evacuation of the bowels, and the taking after each meal of some of those agents that exert a general alterant and tonic influence upon the system, will render the effects of good air and outdoor exercise much more efficient in promoting the restoration of the patient. In this class of cases especially, the effect as a general alterant, and promoter of nutrition, of the syrup of the iodide of calcium in doses of four cubic centimeters (fl. ʒj) after each meal will do much good. If the patient already has some cough and morbid sensitiveness to atmospheric changes, the addition to each dose of the iodide of calcium of two cubic centimeters (fl. ʒss) of the fluid extract of humulus lupulus will render it more quieting and increase its tonic properties. In those cases where the digestive organs are impaired causing more or less distress, flatulency and gaseous or acid eructations after each meal, I have found the use of a prescription containing carbolic acid* given in doses of four cubic centimeters (fl. ʒj) just before each meal, to afford much relief from the gastric symptoms, while the intestinal discharges may be kept regular and natural by taking at bedtime a tonic and laxative pill composed of six centigrams (gr. i) each, of the extract of hyosciamus, sulphate of iron and aloes, and two centigrams (gr. $\frac{1}{3}$) each of blue mass and extract of nux vomica.

For restoring the skin to a healthier condition and securing more perfect elimination of waste material, a warm bath rendered a little stimulating by the addition of common salt may be taken twice per week, and after

* See formula on page 138 of this vol.

each bath as soon as the water is removed from the skin the whole cutaneous surface should be rapidly and freely rubbed with dry, soft flannel until a comfortable glow of warmth is felt over all the surface. The class of patients of which I am now speaking are more liable, during this first stage of the disease, to have the tubercular deposits accumulate rapidly and in larger masses than those of hereditary origin, and correspondingly more liable to hemorrhages. Some of these cases, when sent to the mountain districts for better climate, and especially to the higher altitudes, become more liable to hemorrhage, experience more difficulty of breathing, and are soon obliged to return. The same parties going to a mild climate, at a lower altitude, such as is found in the interior of Florida, some places at the ends of the Allegheny and Cumberland mountains in Georgia and Alabama, or still better in the Bermuda Islands, experience a high degree of relief, and make, apparently, rapid progress toward recovery. Observation has also shown that some rare cases of tuberculosis, in the early stage, are much more inclined to increase with frequent exacerbations of cough and of soreness in the chest, in the early part of autumn and in the spring months, and are better during the steady cold part of the winter season than during the heat of summer. I have seen some whose attack of hemorrhage occurred invariably during the warmer months of the year.

I think such have almost always been most benefited by going to an elevation of three or four thousand feet, and within the boundaries of Colorado, Dakota or the northern portions of California and Oregon. Such of them as have resorted to the south, to Florida or to portions of the Gulf States, and in some instances to the Bermuda or the West India Islands, have been attacked with more frequent hemorrhages, and an increase in all the symptoms of their disease. I have known a few such instances of hemorrhagic tendency to be arrested and held at bay for years by resorting to the cold dry air of Minnesota and the region of Lake Superior. But another class of our patients manifest directly opposite tendencies. During the warm months of summer up to the commencement of the cold wet weather of autumn, they experience little inconvenience, and show but little outward signs of the existence of pulmonary disease; but always manifest indications of increased sensitiveness of the air passages and lungs and of more frequent spitting of blood, during the cold season. These, so far as I have had opportunity for observation and trial, have uniformly been benefited by resorting to the south, either to the hilly districts of Western Texas, as represented by San Antonio, the region of the gulf to which I have already alluded, particularly the orange grove regions of the interior of Florida or the Bermuda Islands. It is this class of patients also, that are found to be greatly benefited by sea voyages; more particularly long sea voyages, taking them through a variety of climate upon the ocean, but usually avoiding the higher latitudes and colder parts of the ocean climate.

In speaking of the benefits of change of climate during the first stage of tuberculosis, I must insist especially upon the benefits of changes which are either permanent or of protracted duration. The very common custom of making visits to the milder climates during two or three of the worst months of the year, and returning to the same influences under which the disease was originated the rest of the year, while productive of some benefit by retarding the progress of the disease and prolonging life, very rarely is efficient in actually arresting the development of tubercle or rendering that already developed abortive. You will perceive, gentlemen, by these remarks in relation to the adaptation of climates to particular classes of tubercular patients, that much discrimi-

nation and good judgment must be exercised if we would give to this large class of patients the degree of benefit to which they are entitled. It is not enough that the physician should by careful physical exploration ascertain the existence of the early stage of tuberculosis and simply tell his patient to go to a mild and dry climate, but it is equally incumbent upon him to inquire carefully into his patient's previous history, training and habits, and into the particular circumstances under which his symptoms became aggravated, and the relative influence of cold and warmth at different seasons of the year, that he may select, intelligently, the kind of climate as to altitude, temperature, dryness, as well as the degree of exercise and outdoor exposure which is best adapted for benefiting each individual case. I am satisfied, from long observation, that the lack of discrimination in these respects, together with the neglect to enjoin a sufficient degree of permanency in the changes made, has rendered almost nugatory a large part of the efforts made by consumptive invalids for the recovery of their health.

The indications for treatment in the second stage of tuberculosis, when the patient begins to have plain indications of softening in the tubercular masses and those inflammatory engorgements or low grades of circumscribed pneumonic attacks in the lung tissue contiguous to the tubercular mass, which usually constitute the first symptoms that awaken the patient and his friends to the necessity for seeking professional advice, are, as far as practicable, the continuance of all those measures calculated to sustain and improve the processes of assimilation and nutrition, and in addition the prompt and judicious counteraction of those inflammatory congestions and exudations in the tuberculated portions of the lung which so frequently recur during this stage of the disease. It is in reference to the warding off of these inflammatory attacks, and keeping the lung tissue as long as possible free from inflammatory exudation and suppuration that the treatment at present most in vogue for consumptive patients is defective.

Regarding the disease as one of general impairment and the great object to be accomplished, that of improving and sustaining nutrition, the profession has recommended too indiscriminately the use of rich food, alcoholic drinks, and active exercise, without due regard to the existence of those frequent intercurrent attacks of genuine inflammation in the pulmonary tissue containing the tubercular deposits. The physician in this second stage should be constantly on the alert for these attacks, and promptly direct remedies for allaying the morbid excitability of the irritated pulmonary tissue and lessening the vascular congestion, thereby mitigating the cough, soreness, feverishness, and postponing, if not preventing the establishment of the suppurative process, and all its destructive consequences. It is often as necessary, on a fresh exacerbation of feverishness, soreness in the chest, increased cough, and quick pulse, that the patients be placed at rest, in pure air, and limited to a well selected diet, and given mild anodyne expectorants with emollient applications to the sore part of the chest, until these symptoms disappear or are much relieved, as it would be in similar attacks without any tubercular complications. But this fact is often overlooked, and patients encouraged to ride, walk and exercise every day, when a week or two of rest with proper treatment would effectually remove these symptoms and place the patients in a condition, where the cautious resumption of daily exercise, gradually increased, and a return to all those remedies and influences which tend to strengthen and improve the nutritive processes and the efficiency of the respiratory function would be well borne and highly beneficial.

I have seen cases not infrequently where the patients were suffering with all the complex indications of inflammatory action in the connective tissue around the tubercular masses, who had been ordered directly to change climate, take free outdoor exercise and a liberal diet. Some of these cases resulted in a general pneumonic attack, diffuse suppuration and death of the patients, while the condition of others was simply made worse. The remedies which I have found most efficient in warding off these inflammatory attacks, lessening cough, rendering the expectoration easy, promoting rest at night, and yet producing very little impairment of appetite or digestion, has been a combination of muriate of ammonia, tartrate of antimonium and potassium, and sulphate of morphia, dissolved in the syrup of liquorice in such proportions that four cubic centimeters or one teaspoonful would contain four decigrams (gr. vi) of the first, four milligrams (gr. 1-16) of the second, and five milligrams (gr. 1-12) of the third. This quantity may be given every four, six or eight hours according to the severity of the symptoms. As soon as the more active inflammatory symptoms have abated and this mixture is required only morning and evening, such patients may profitably commence taking almost any of those agents that promote nutrition, such as the compound syrup of the hypophosphites with cod-liver oil, syrup of the iodide of calcium, lactophosphate of calcium, and in some instances the syrup of the iodide of iron. Quinine also is frequently given with benefit in doses of thirteen to twenty centigrams (gr. ii to iii) three times a day.

In cases liable to hemorrhages, either with or without febrile exacerbations and inflammatory symptoms, ergot or preferably ergotin, becomes one of our best remedies. During the hemorrhage the ergotin may be given in doses of from thirteen to twenty centigrams (gr. ii to iii) every two or three hours, according to the activity of the hemorrhage. After the blood has ceased, the patient will be benefited, and a recurrence of hemorrhage prevented by continuing thirteen centigram doses of the ergotin three times a day, for one, two or even three weeks. And if night sweats have supervened, as occasionally happens in the last half of the night, two decigrams (gr. iii) of the ergotin, taken between eight and nine o'clock in the evening, will be one of the best remedies for arresting these sweats. During the second stage of tuberculosis, the question of change of climate and the degree of outdoor exercise that the patient shall take must depend much upon the extent of the tubercular deposit and the degree to which the lung tissue has become involved in morbid changes.

A large proportion of the cases in this stage will be temporarily benefited by going, during the cold and transition periods of the year, to a mild and dry climate, with only a moderate elevation. The higher elevations of five, six or even four thousand five hundred feet should be avoided. If they are ever reached it should be done gradually at successive stages from the lower to the higher elevations alluded to. But if the patient finds a climate in which the progress of tubercular changes is arrested, and reparative processes are so far established as to indicate recovery for the time being, he should be induced, if practicable, to make that climate his permanent home. For experience has abundantly shown that these temporary appearances of returning health are often delusive; and if the patient returns to the same climate in which his disease originated, characterized by cold, damp, and frequent changes, as in the northern belt of this country, he will rarely pass through the first cold season without having all the phenomena of his disease renewed in an active form. When the disease has passed beyond this second stage, and the

suppurative processes have completed excavations of more or less size in the structure of the lungs, with many additional places not excavated but in a softened and purulent condition, with much emaciation, it is very rare that any change of climate proves either beneficial or desirable. And, at such a period in the advancement of the disease, to induce the patient to tax his weary limbs and emaciated form with the effort to find a better climate, and perhaps die among strangers, is a cruelty instead of an appropriate remedy. The only cases in the third stage of advancement that offer a hope of recovery from any such change are those rare instances in which the deposits have been limited to the upper portion or apex of a single lung. In such, although the part affected may have passed through the three successive changes and left a well marked excavation furnishing purulent sputa and moderate hectic symptoms, yet the patient still has one whole lung and the greater part of the other left intact, which should be sufficient for carrying on the respiratory function efficiently until the reparative processes have restored the diseased parts by granulation and ultimate cicatrization, and brought the patient to recovery. I have seen some instances in which this result was obtained without a change of climate. A judicious and favorable change, however, will facilitate it and render its accomplishment more certain. But where, as in the great mass of cases, the suppurative process has involved a considerable portion of one or of both lungs, there is no rational hope of the patient's living till repair can take place. Consequently, both the interests of the patient and his friends, as well as the common principles of humanity, require that such parties be candidly informed of the condition and prospects of the patient. At the same time give them the comfort that can be obtained by quiet, rest, a home among their friends, as good air as can be obtained, careful selection of nourishment and repression of the more troublesome symptoms by appropriate remedies and you will do as much to alleviate the suffering and protract the life of your patient as the nature of such cases will permit.

The same combination of anodynes and expectorants as were mentioned in the second stage may still be taken at night, to lessen cough and promote rest. The use of such tonics as syrup of the iodide of iron, sometimes combined with glycerine, given in appropriate doses, largely diluted with water, will materially lessen the suppurative process, and the use of ergotin in sufficient doses, once or twice in twenty-four hours, will greatly lessen the night sweats. The particular remedies to be used, however, must be selected by the good judgment of the practitioner, according to the indications in each individual case. I have thus described the treatment in the different stages of tubercular disease in the lungs with a view of giving you the principles on which the treatment should be based, and remedies should be selected, whether hygienic, climatic, or medicinal rather than to multiply suggestions of individual remedies. I am fully satisfied that there are large numbers of cases of tubercular disease of the lungs which if diagnosticated and treated on the principles that I have indicated in the early stage would be rendered abortive, the health preserved, and a few would be snatched from the further progress in the second stage of the disease. And yet, with all our care, and the most intelligently directed efforts to give this class of patients all the chances that the present status of medicine and hygiene will afford, a very large majority will progress to a fatal result. And pulmonary tuberculosis will probably continue for ages to come, as it has been during the ages past, one of the most direful diseases known to the human race; destroying more lives by far annually among the civilized portions of the human race than any one of all the dreaded epidemics and scourges that can be named.

LECTURE XLVIII.

Inflammations of the Central Organs of Circulation — The ifferent structures involved — Pericarditis—Its Causes, Symptoms, Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: I now invite your attention to the inflammations affecting the vascular system or organs of circulation. These organs include the pericardium and the heart as the center of the system, and the arteries and veins, capillaries and lymphatics. The diseases of the arteries, veins and lymphatics are so largely connected with injuries and affections of a surgical character, that the inflammations affecting them are fully treated of in works on surgery, and instruction concerning them is usually included in the courses on surgery in all the medical schools. I shall, therefore, pass them by with the exception of the aorta. This leaves for our consideration, chiefly, the central organs of the circulation composed of the pericardium, heart and the aorta. Inflammation may be limited to the serous membrane called the pericardium, which surrounds the heart in the form of a sac and is reflected over its exterior surface. It is then called pericarditis. It may be limited to the muscular structure of the heart and is then called either carditis or myocarditis. It may be restricted to the interior cavities of the heart, including the valves and columnæ carnæ, and is then called endocarditis. The two latter, myocarditis and endocarditis are so generally associated together in the same case, that for practical purposes they may be considered under the same head. You may have inflammation affecting these various structures, occurring more or less at all periods of life, and in both sexes, but not as frequently as we have inflammation of the organs of respiration. For an idiopathic, primary inflammation of any of the cardiac structures occurring independently of other and more general diseases, is comparatively rare. You may also meet with cases of inflammation in these structures presenting all grades of activity, from the most acute and rapid in progress to the most chronic and protracted in duration.

Pericarditis.—I shall first direct your attention to inflammation of the serous membrane called pericardium. Acute pericarditis is of frequent occurrence in connection with acute rheumatism or rheumatic fever, also as a complication of renal diseases, more particularly the different forms of albuminuria and structural diseases of the kidneys, and less frequently as a complication or as a sequel of eruptive fevers, more particularly scarlatina and diphtheria. According to the statistics of some recent writers, one case out of every six of rheumatism of an acute character becomes complicated with pericarditis. This, however, is a very much higher ratio than has occurred under my observation during a period of many years both in private practice and in the hospitals. In referring to some of the records I am quite sure that taking both classes of cases, those in private practice and in the hospitals, I have not met with pericarditis in connection with any grade of rheumatic disease in a larger proportion of cases than one in thirty. When it occurs in connection with rheumatism it is not in the form of metastasis or translation of the rheumatic inflammation from the fibrous structures or articulations to the pericardium, but is the result of the action of the same cause pervading the blood, that gives rise to inflammation in any other portion of the body, and its occurrence in the pericardium in no wise lessens its coincident progress in ei-

ther the articulations or other structures. Its occurrence in connection with renal disease is traceable to the effects of retained urea or an excess of the constituents of urine in consequence of the inability of the kidneys to perform their office. It is probable that it originates from a similar cause when it occurs coincidently with, or is a sequel of the eruptive fevers; it being most likely to occur where the function of the kidneys has been interfered with prior to the occurrence of the periodical disease. The occurrence of acute pericarditis aside from its connection with the general diseases and pathological conditions already alluded to, and independently of traumatic influences, such as wounds and injuries, is very rare. As a disease arising from atmospheric influences such as exposure to cold, sudden changes, dampness, with which inflammations of the respiratory organs are so intimately connected, pericarditis is hardly known. I have met with two or three instances, occurring in patients who, after being subjected to severe and protracted muscular exercise, causing free perspiration, were suddenly exposed to sufficient cold, damp air to make a chilling impression upon the system. These attacks were undoubtedly the result of a sudden impression of cold and damp on a state of the system rendered more susceptible by the immediately preceding exercise. In a few instances I have met with pericarditis as a complication and coincident of pleuritis; not apparently caused by extension of the disease from the pleura to the pericardium, but both occurring from the same cause.

Symptoms.—In a large majority of cases of acute pericarditis the disease manifests itself abruptly, by initial chilliness, coincident with pain, and a sense of oppression in the region of the heart. The chilliness is of very brief duration, sometimes hardly noticeable, and is followed by acute pain, resembling in all respects the pains described as characterizing acute pleurisy, only they originate more directly in the cardiac region, and often radiate backward under the left scapula, and sometimes upward to the top of the shoulder. The pain is not continuous, but rather paroxysmal, and is aggravated much by full inspirations or any other motions of the body or chest which may cause movements of the pericardium, in its relation to the parts around it. The acute pains in the pericardial region are accompanied from the beginning by increased frequency of pulse, short and hurried breathing, increase of temperature, constituting a moderate grade of general fever; more or less flushing of the face, a decidedly anxious expression of countenance, and a frequent, short, voluntarily suppressed cough with no expectoration. The secretions generally are diminished, the urine being more scanty and higher colored than natural. A thin whitish fur forms upon the tongue, and there is considerable thirst. In some cases there is severe frontal headache. In a few instances the pain in the head is accompanied by more or less tendency to delirium, the latter being sometimes sufficiently prominent to divert attention from the real seat of the disease in the pericardium. In its acute form, the course of the disease is usually rapid, the pulse becoming more frequent and less full, until it ranges from one hundred and twenty to one hundred and forty per minute, and is easily compressible.

There is also a great sense of oppression or fullness in the cardiac region, increased by attempting to assume the recumbent position. Loss of flesh, paleness, and still more anxiety in the expression of the countenance, more frequent, short, dry cough, voluntarily suppressed as much as possible to avoid the pain that it occasions is also noticeable. In cases of the greatest degree of intensity these symptoms increase rapidly, not infrequently occasioning feelings of syncope, some degree of mental wandering, persistent disposition to keep the upright position of the body or to

lean a little forward. The heart's action is irregular and feeble. There is coldness of the extremities, blueness under the nails and of the lips, short, panting respiration, great desire to sleep without the ability to do so, the patient generally starting up as if frightened, almost as soon as consciousness was lost in sleep. The patient now becomes extremely weary, pale, haggard, with sometimes a little puffiness or œdema of the eyelids, and if not relieved by treatment before the middle or latter part of the second week, the heart becomes so embarrassed from the exterior pressure of the pericardial effusion that it is no longer capable of maintaining the circulation, and the patient dies.

When the disease occurs as an idiopathic affection without complication with renal or other prior diseases, it rarely presents as severe a course as I have just indicated. The symptoms, however, are the same, only less intense, and after about two weeks the patient begins gradually to improve, the fever abates, the pulse becomes a little slower and more steady, the sense of oppression in the chest less, and the improvement in these respects increases gradually from day to day until, during the fourth week, the patient reaches convalescence. In some cases there will be shortness of breath and inability to exercise for a longer period than this; often as long as from six to seven weeks from the commencement of the attack. This protraction of the case arises generally from the continuance of irritative action and the slowness of absorption of the effused fluid in the pericardium. A great majority of cases run their course and have a tendency to terminate in recovery in from three to four weeks. A few may even terminate in convalescence in two weeks from the commencement of the attack. When the disease occurs as a complication of rheumatism the symptoms are essentially the same as I have detailed, throughout its entire course, with the exception of the absence of initial chilliness and the modifications in the general grade of fever produced by the accompanying general rheumatic affection. In the cases associated with rheumatism the tendency is generally to recovery, only a small proportion of the whole number of cases terminating fatally.

When the disease originates from retained renal excretions or from retention of similar excretory matter in connection with the eruptive fevers, it is very much more likely to progress unfavorably and terminate in death. The latter class of cases usually occur in conditions of the system already anæmic and inclined to take on readily copious serous effusions. And in the cases of complication with renal disease the patient is not infrequently affected with general anasarca prior to the supervention of the pericardial inflammation. In consequence of this the latter affection is accompanied by early and unusually copious serous effusion, and is very liable to produce fatal compression of the heart before it can be controlled by remedies. Some of this class of cases may reach a fatal result within twenty-four, forty-eight or seventy-two hours from the time of the commencement of the attack.

Thus far I have spoken only of the general symptoms and progress of the disease, which, though sufficiently characteristic to afford a pretty safe diagnosis, yet, they may be so closely simulated by pleuritic inflammation and perhaps some other affections that it is always desirable to note carefully the signs to be obtained by auscultation and percussion. If these are noted, they are sufficiently characteristic to render the diagnosis easy and reliably certain. During the first stage of acute or subacute inflammation the pericardial membrane is simply intensely injected, tumefied and dryer than natural. The membrane covering the exterior of the heart and that lining the pericardial sac have their surfaces in contact, and

the motions of the heart rub these surfaces against each other, thereby producing in this first stage of the inflammatory process a rubbing or friction sound precisely of the same nature as the friction sound that I have described when speaking of the first stage of acute pleuritis. It is generally heard as a double sound both in the systolic and diastolic movements of the heart, and while of the same character as the friction in pleuritis it is distinguished from the latter by its occurring synchronous with the movements of the heart and not with those of respiration. This friction sound is usually heard most distinct and earliest over the central part of the cardiac region near the base of the heart. And in some cases it may continue to be heard in this region throughout the whole course of the disease. In the great majority of acute and subacute cases it ceases to be heard somewhere between the beginning of the second and the end of the fourth day of the disease. When this disappears the cardiac sounds appear more distant and the impulse fails to be felt as plainly against the walls of the chest as in the natural condition or as existed at the commencement of the disease.

This more distant beat of the heart and lessening of the impulse occurring at the same time with diminution or disappearance of the friction sound would of itself suggest the occurrence of serous effusion sufficient to separate the two surfaces of the pericardium and remove the heart a little farther from the walls of the chest. If we now practice percussion carefully we shall find that the area of cardiac dullness is decidedly increased, more particularly transversely on a line with the lower margin of the nipple, and to a very appreciable extent also vertically; even making the area or extent over which the cardiac dullness is well marked, from one third to double the natural size. At the same time in many cases there is a perceptibly increased fullness or bulging of the cardiac region particularly noticeable in the intercostal spaces in the center of the cardiac region. These physical signs taken in connection with the general symptoms and the location of the pains the patient suffers are sufficient to distinguish the disease from any other inflammatory condition within the chest. They are not only sufficient to distinguish it from inflammations of other structures, but they are sufficient also to indicate the stage of the disease, and the pathological changes which have taken place during its progress.

Pathological Changes.—You will have noticed from the description I have given that pericarditis is divisible in its progress into the same number of stages as pleuritis. The pathological changes are also identically the same: that is, we have first, intense injection or accumulation of blood in the vessels of the pericardium, giving it an intensely red and tumefied appearance during which we have friction sound. In from twenty-four to forty-eight hours, usually, this engorgement is followed by exudation. In the large majority of cases the exudation is of a mixed character, partly plastic, forming a layer of organizable material on the surface of the inflamed membrane, and partly serous, which gives rise to a more or less rapid accumulation of a serous fluid in the pericardial sac. The relative proportion of these two kinds of exudation varies much in different cases. In a very few occurring in individuals whose blood is highly plastic the exudation is entirely of a plastic organizable character and rapidly solidifies into a thick layer of false membranous material which closely adheres to the inflamed surfaces, and soon forms a bond of union between them, causing adhesion of the exterior pericardial membrane to that covering the body of the heart. The motions of the heart frequently cause this layer of plastic material to be worked into little masses or tufts,

that give to the surfaces the appearance of being covered with a ragged, fibrinous layer with tuft-like projections which had been united with the opposed surfaces. When the patient survives in this class of cases this plastic exudation forms a bond of permanent union between the two surfaces of the pericardium.

Occasionally this will be so complete that the pericardial sac is entirely obliterated. In other instances the adhesions will occupy only a part of the surfaces, leaving other portions free. At first the adhesions offer some embarrassment to the cardiac action and give rise in the feelings of the patient to more or less inconvenience and sense of oppression. This gradually disappears with time, and the modified friction sound that continues throughout the whole course of the disease, and that may be protracted even into the period of convalescence, eventually disappears. The adventitious tissue becomes smooth and attenuated to such a degree as to cause no longer any abnormal sound. In a larger number of cases the plastic exudation is sufficient only to form a layer of white fibrinous material unequally distributed over the inflamed surface, and to cause small patches of adhesion near the base of the heart, while the serous effusion accumulates with such rapidity as to separate all the free surfaces of the pericardium from each other, and to give rise sometimes to a degree of distension of the sac and consequent pressure upon the body of the heart, so as to embarrass its action. It is this accumulation of serous fluid in the pericardial sac that in severe cases causes the extreme sense of fullness, difficulty in lying down, and irregularity and weakness of the heart, to so great a degree as to occasion a fatal result. More generally the pericardial effusion is only sufficient to produce moderate distension.

The fluid in some cases is clear, and in others slightly turbid. In the latter case it contains some white corpuscles and pus globules, and in rare instances, enough of the red corpuscles of the blood to give it a tinge of redness. Suppuration, however, in the pericardium is very much more rare than in the pleura. Still it occasionally occurs, more especially when the inflammation has supervened upon some previous impairment of the constitutional condition of the patient. The structural changes in the inflamed membrane itself are simply those which are observed in all inflammations of structures made up largely of connective tissue. They consist in an increase of the endothelial cells and hypertrophy of the connective tissue itself. If you follow those cases of pericarditis that result in extensive adhesion of the pericardial sac to the body of the heart, to their remote consequences, you will find that they generally lead very slowly but surely to an increased growth or hypertrophy of the muscular structure of the heart; so gradually, indeed, that it requires many years in some cases, before this hypertrophy produces sufficient inconvenience to attract serious attention. In a few instances, however, the progress of this change is more rapid, and in addition to a simple increased muscular growth, you find more or less dilatation of the cavities of the heart, making the increased size consist partly of dilatation and partly of muscular hypertrophy.

A case illustrating the slowness of these changes occurred under my observation a few years since, in which I had the opportunity of witnessing the post mortem examination of the patient who had died with general dropsy, which was preceded one or two years by constant and very distressing irregularity and inefficiency of cardiac action, rendering him wholly incapable of active exercise; yet previous to these last two years he had led an active business life, being very rarely confined to his house by sick-

ness, making no complaint, and passing, as a good and sound subject several times, examinations for life insurance. As his family physician I had examined him several times in the course of the twelve years prior to the last two without detecting any other fault in the heart's action than unusual slowness of beat and an occasional intermittence. I first detected the slowness and intermittence of his pulse on his recovery from an attack of epidemic cholera in 1854. And yet on the post mortem examination the pericardium was found so closely adherent to the entire surface of the body of the heart as to leave not one square inch of that surface free, and so close as to require actual dissection with the scalpel to separate one layer of pericardium from the other. Nearly the entire circumference of the pericardium, also, contained thin laminæ of bone, in some places a line in thickness, and the different plates so closely touching each other a to form an almost continuous bony case around the heart. Plates of bone were also found in a few of the arteries; quite large ones in the aorta, and in various places where examination was made even as remote as the femoral artery in the middle section of the thigh. The muscular structure of the left ventricle was one third thicker than natural; both ventricles were dilated to a larger size than natural, making the whole heart nearly twice its normal size. In closely examining the previous history of the patient it was found that these pericardial adhesions had resulted from an attack of acute pericarditis more than thirty years previously.

Diagnosis.—In describing the symptoms and physical signs, I have already indicated those which are specially diagnostic of this form of disease. The only cases in which they are liable to fail in constituting a safe guide, are those rare cases of pleuritis in which the latter inflammation occurs in that part of the left pleura in contact with the pericardium. A few of these cases have been found to yield a friction sound synchronous with the motions of the heart, although the pericardium was itself free from inflammation. The systolic action of the heart produced sufficient motion in the adjacent pleura to occasion a friction. These cases can usually, however, be separated from the friction of true pericarditis by noting carefully two things: first, that although the motions of the heart produce a rubbing or friction, the respiratory movements also produce a friction. After carefully watching these respective movements and especially having the patient suspend respiration for a few seconds so as to get the movements of the heart separately, then resume respiration, usually it can be ascertained that the friction sound exists with the respiratory movements as well as with the cardiac. The other circumstances which aid in the diagnosis are that this friction, when dependent upon pleuritis, is always on the left margin of the cardiac space, and is also audible with the respiratory movement alone still further to the left, showing that it follows the position of the pleura and not of the pericardium.

Prognosis.—You will infer from what has already been said that acute pericarditis, when not associated with renal disease or with eruptive fevers, has a general tendency to recovery, and that the ratio of deaths directly from the disease in small. This remark is applicable not only to strictly idiopathic pericarditis, but also to those cases of the disease which arise in connection with acute rheumatism. On the other hand a very large proportion of the cases that occur as complications in the progress of acute and chronic renal diseases, and as the sequel of eruptive fevers, prove fatal.

Treatment.—As the pericardium possesses similar anatomical structure and similar functional relations with the pleura, and as the inflammations affecting it pursue the same general course, pass through the same stages,

and produce the same anatomical changes as in inflammations of the pleura, so the indications for treatment are in all respects similar. Having fully discussed the subject of treatment of pleuritis, only a few days since, I do not deem it necessary to enter into the same detail in reference to the disease now under consideration. The principles which govern us in the management of acute pericarditis being identical with those set forth for pleuritis in the several stages, and the remedies for accomplishing the objects being also the same, it is sufficient to refer you to the treatment of the latter disease as applicable to the former. This remark applies strictly to the use of such remedies as bleeding, general and local and cardiac sedatives in the first stage of acute cases, and the subsequent use of remedies to promote absorption of the effused fluid, and diminish the plasticity of the organizable exudation as alteratives, diuretics, and counter-irritants.

I must make an exception, however, in reference to those cases which occur in the progress of acute articular rheumatism. In these, in addition to such treatment as I have recommended in the different stages of pleuritis, it is of much importance that the patients have early and efficient treatment with alkaline carbonates, more especially the carbonates and bicarbonates of sodium and potassium, sufficient to fully neutralize the supposed acid cause of the rheumatic inflammation. And, it is proper to add, that as the exudations in the earlier stage of acute rheumatic inflammation are pre-eminently plastic and disposed to take on permanent organization, the use of mercurial alteratives as an item in the treatment during the first two or three days of acute pericardial inflammation may be productive of decidedly good effects; being careful always not to continue their use until the establishment of salivation or any unpleasant symptoms affect the mouth. Those cases of pericarditis which are associated with renal disease, or occur as the sequel of eruptive fevers, are associated with a debilitated and generally anæmic condition of the blood, and consequently they will not bear active depletion, either by loss of blood or the use of such evacuants as are calculated to further deplete the patient. In such cases the chief reliance must be placed upon the use of such anodynes and diuretics as will lessen the pain, keep up as efficient action of the kidneys as possible, and upon the cautious use of remedies to lessen the frequency without impairing the force of the heart's action.

Of these, the fluid extracts of the cactus grandiflora, convallaria, and digitalis are the best. To these may be added blisters or some form of efficient counter-irritation. When the pericardial inflammation has assumed a chronic form, as it sometimes does, either primarily or as the sequel of an acute attack, there is usually a tendency to continue the serous exudation causing a progressively increased distension of the pericardial sac and pressure upon the body of the heart. In all such cases, whether they are idiopathic, or whether they arise as complications of other diseases, the use of iodine alteratives internally, aided by digitalis and persistent counter-irritation by a succession of small blisters, will constitute the best mode of treatment, and will in many cases check the further progress of the disease and lead to the ultimate re-absorption of the effused fluid, and the recovery of the patient. But, where this treatment fails and the pressure begins to assume a dangerous degree of influence over the heart's action, threatening the life of the patient, no further time should be lost without resorting to the puncture of the pericardium and the evacuation of the effused fluid. In cases requiring such puncture, usually the distension of the pericardium is such as to have increased its transverse diame-

ter more than one half, and usually the most favorable place for the puncture either for aspiration or any other method, is in the fifth intercostal space, perhaps an inch or an inch and a half to the left of the margin of the sternum. This may be varied in particular cases, and the practitioner should judge in each case by a careful examination and percussion as to the exact outline of the pericardial distension, both transversely and vertically, and aim to make his puncture over the most prominent and fully distended part of the pericardial sac. In the large majority of cases it will be found at the point I have indicated. The operation of tapping the pericardium has been performed a sufficient number of times to show that it is not only justifiable, but, with a sufficient proportion of recoveries from cases that would otherwise have proved fatal, to make it the duty of the practitioner to give his patient this additional chance of recovery. Instead of using the aspirator needle and removing the fluid by the ordinary process of aspiration, it is better to puncture the pericardium with a trochar to which is fitted a Davidson's syringe, for the reason that the stylet of the trochar being withdrawn leaves no sharp point to wound the surface of the heart as the fluid is drawn off and the distension of the sac diminishes. In those cases of pericarditis which occasionally occur, terminating in suppuration and presenting a fluid when withdrawn, either wholly or partially of a purulent character, the prognosis is very much more unfavorable; and yet, there are on record several cases of this kind that ultimately recovered. There is no absolute barrier against their being treated in the same manner as cases of empyema resulting from suppurative pleuritis; that is, by free opening and drainage.

LECTURE XLIX.

Myo- and Endocarditis; Their Relations, Causes, Symptoms, Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: As we stated at the commencement of the preceding lecture, myocarditis means inflammation limited to the muscular structure of the heart. In a large proportion of the cases, more especially of rheumatic inflammation of the heart, the disease has commenced in the muscular structure alone. I have been able to detect in many cases from one to three days before the development of any of the physical signs of inflammation in the endocardium, that quick, irritable and excitable systolic action of the heart, accompanied by a lengthening or exaggeration of the first or systolic sound, and a dull heavy pain in the cardiac region which indicated positive irritation in the muscular structure. And in a very few instances the pain accompanied by the physical signs I has described, after continuing from three to five days, under efficient treatment has disappeared without the supervention of any further cardiac symptoms. I have regarded these as cases of true myocarditis of a mild character, progressing no further than to involve the muscular structure, while the former cases represented the commencement of the dis-

case in the muscular structure first, and extending directly to the endocardial membrane, and finally developing all the phenomena of endocarditis. Endocardial inflammation is of frequent occurrence as an accompaniment of inflammatory rheumatism, but as a separate disease, arising from the ordinary causes of inflammation in other structures of the body, it is comparatively infrequent. Neither does it occur as often as pericarditis in connection with either renal disease, or the idiopathic or eruptive fevers.

Symptoms.—The symptoms which characterize acute endocarditis, whether occurring in connection with rheumatism or idiopathically, consist chiefly of a dull oppressive pain in the cardiac region, often extending upwards to the shoulder, sometimes backward under the scapula, and not infrequently down the left arm, producing a peculiar dull aching pain, more particularly between the shoulder and elbow.

The pulse is usually full, moderately firm under the finger, accelerated in frequency to from eighty-five to one hundred beats per minute, respirations accelerated rather more in proportion than the acceleration of pulse; the patient frequently feeling a sense of oppression in his breathing; and showing a disposition to have the shoulders elevated and to incline the body to the left although not lying over upon the side. There is usually less than the ordinary moisture of the mouth, whitish fur upon the tongue, moderate degree of thirst, less than the natural flow of urine which is usually deeper colored, but little derangement of the alimentary canal, although in most cases of an acute character, the appetite is lost and the bowels are a little inclined to constipation. The temperature of the body after the first twenty-four or forty-eight hours, usually ranges from three to five degrees above the natural standard, varying but little between morning and evening.

None of these general symptoms are sufficiently distinctive in their character to enable the physician to render a positive diagnosis regarding the seat of the disease. But by resorting to the physical signs, auscultation and percussion, such alterations from the natural sounds and movements of the heart may be detected as to add certainty to the diagnosis. First, from the early beginning of the disease in the interior of the heart, the impulse against the walls of the chest is increased in force and frequency, and auscultation readily detects the exaggerated and more blowing character of the first or systolic sound of the heart. This may be at first slight, leaving a clearly appreciable interval between the first and the second sounds, and usually in from twenty-four to forty-eight hours it will have increased sufficiently to be easily recognized as the bellows murmur, and sufficiently prolonged to cover nearly or quite the interval between the first and second sounds, apparently obliterating the latter. This sound is usually heard with most distinctness a little to the sternal side of the nipple and directly over the base of the heart, and from that downward to the left side over the apex. If there be no pericardial complication and effusion, simple inflammation of the endocardium, does not alter the size of the heart sufficiently to give any increased area of dullness on percussion. As the disease advances, the bellows murmur becomes more and more rough or harsh in its quality, and may be heard more distinctly over the apex or immediately below the left nipple, but when, as is often the case, the inflammation is limited to the semi-lunar valves of the aorta and adjacent parts, an equally distinct and rather rough bellows murmur may be traced from the base of the heart upward along the course of the aorta nearly or quite to the arch. The sound of course diminishes in proportion as we recede from the heart itself. In many cases of endocarditis the inflammation extends beyond the cavity of the heart along the lining of the aorta, causing more or less

thickening and roughness of the membrane in this large artery, and in such cases the harsh rough sound, synchronous with the systole of the heart, may be heard as distinctly or even more distinctly than the ordinary bellows murmur over the heart itself.

It is rare that these sounds are heard as distinctly over the right as over the left side of the heart. In cases which prove protracted, extending through two, three or four weeks, or as is often the case when associated with rheumatism, the alterations of the mitral valve, or the semi-lunar of the aorta, and sometimes of both in the same case, become so great that the valves fail to close their respective openings during the systolic action of the heart, the bellows murmur becomes altered in such a direction as to indicate regurgitant sounds. If the alterations include the mitral valve only, the regurgitant sound will accompany each impulse of the heart. If the semi-lunar valves of the aorta fail in their office the regurgitant sound will be heard more over the base of the heart and commencement of the aorta, and will immediately follow the impulse, being synchronous with the diastole. If the inflammation subsides early, the sounds that I have described will usually diminish with considerable rapidity, and in the course of two or three weeks may entirely disappear. But when the inflammation runs a more protracted course, the thickening and induration of the valvular structures and adjacent parts become more permanent, and either perpetuate the sounds through a long period of time, or as is not unfrequently the case, fail ever to subside entirely, leaving the patient subject to permanent cardiac inefficiency, and all those ulterior consequences which will be hereafter described. In cases of very acute endocarditis, after the first few days the patient usually becomes extremely depressed, or affected by a sense of great weakness, oppression in the chest, a feeling of insufficient respiratory movements, and inclination to be bolstered up more in the bed, and to be greatly fatigued by any slight exertion. Sometimes getting out of bed with the utmost care for ordinary evacuations will lead to panting, hurried respiration, irregularity and sometimes intermission of the pulse, and such a sense of sinking as to be very alarming to the patient.

Occasionally, in those cases that are severe and accompanied by much embarrassment of the heart's action, and probably by more or less exudation upon the surface of the inflamed parts of plastic material, either in minute shreds or patches, or by the formation of fibrinous clots in the cavities of the heart, some of these materials are carried from the cavity of the heart, by the current of the circulation, into remote organs, constituting emboli that are liable to suddenly plug the vessels and thereby interrupt important functions. Sometimes larger clots form in the cavity of the heart and greatly add to the embarrassment of its action, and cause some peculiarities in the cardiac sounds. The pulse generally becomes very weak and irregular, while the action of the heart is tumultuous, the breathing hurried and greatly oppressed, and the countenance expressive of great anxiety. Occasionally in these cases larger portions of a fibrinous clot in the heart are carried into the vessels, sufficient thus to plug one or more of the larger arteries. A case came under my observation within the last year, the history of which, as given by the attending physician, indicated that during convalescence from a moderate grade of typhoid fever the patient had been attacked with endocarditis, followed in a few days by the formation of a fibrinous clot in the left ventricle, giving rise to an extraordinarily tumultuous action of the heart, and great anxiety in the mind of the patient, with a remarkable degree of pulsation throughout the whole arterial system of vessels. About the third day there occurred

a sudden and entire suppression of the pulse in the right arm. There was no other special change in the symptoms but a complete suppression of the radial pulse. On tracing the artery upward to its connection with the subclavian through the axilla, it was found that the obstruction was in the brachial artery about one inch below the border of the axilla, and was undoubtedly from a clot or embolus carried from the cavity of the heart. About two days later, symptoms of plugging of vessels of the brain followed, and the patient died. No post-mortem, however, could be obtained.

In another instance that came under my observation there was every evidence, from the physical signs and the symptoms of the case, that extensive pulmonary embolism occurred in the progress of endocardial inflammation, which had become complicated with all the signs of a heart-clot. Similar cases have not been of frequent occurrence under my observation, and yet, that they are liable to occur now and then should be borne in mind by the practitioner, and the usual liability to form fibrinous exudations, shreds, and larger clots or emboli in the progress of endocardial inflammation, should constitute a reason for the practitioner, not only to be on the alert for their detection, but it should also lead to such treatment of all these cases as would be most likely to lessen the tendency to the accumulation of the fibrinous elements of the blood, as well as to limit exudations of a plastic character. In the great majority of cases of endocarditis of an acute or sub-acute grade, whether in connection with rheumatic disease or not, the acute stage passes by in from two to three weeks; often leaving, however, such changes in the interior lining or valvular structures as to cause more or less morbid sounds, and impairment in the circulation for a much longer period of time.

These changes to which I allude consist of the usual thickening or tumefaction and induration of the inflamed structures. The principal structure involved is the delicate membrane lining the cavities of the heart, and which also constitutes the principal structure of the valves; the latter being, in fact, but little else than the lining membrane folded upon itself. But while the effects of the inflammation in the membrane lining the walls of the ventricles, or covering the columnæ carnæ, may subside to such a degree as to occasion little or no inconvenience, or even disappear wholly, yet after the valvular structures have been involved, causing them to be thicker, denser and less flexible than natural, they usually remain thus mechanically obstructing the free passage of blood through the openings of the heart, thereby inducing secondary changes which take place slowly at first, but ultimately reach a development that seriously impairs the patient's usefulness, and shortens life.

What was but a slight obstruction to the circulation during the first few weeks and sometimes months after the subsidence of the cardiac nflammatory attack, becomes in process of time so much increased as to have induced increased growth in the muscular structure, constituting hypertrophy of the walls of the ventricles, more particularly of the left, corresponding habitual tendency to fullness of the left auricle and pulmonary veins, thereby producing fullness of the capillaries in the lungs, pressure upon the air cells, difficult or asthmatic breathing, greatly increased by attempts to exercise, or whatever tends to increase the frequency of the heart's motion, until in a few months or years many of these patients become entirely incapacitated for active exercise. When they have reached this stage in their progress, there is an almost uniform tendency to passive congestion of the kidneys and diminished secretion of urine, which added to the irregular and inefficient circulation of the blood, is

soon followed by dropsical effusions. These are first noticed as the patient rises from bed in the morning, in the form of fullness or œdematous swelling of the loose tissue of the eyelids, and a general appearance of fullness of the face. If he is up, with his feet dependent during the day, the puffiness of the face and eyelids disappears in a great measure, but as night comes on, the feet along the top and behind the malleoli of the ankles, present a swollen appearance which pits on pressure, showing that the serous effusion has commenced in the lower extremities.

These slight indications of dropsical infiltration continue slowly to increase until they exist universally throughout all the areolar tissue of the exterior of the body. If left to its own natural tendency, after the exterior areolar tissue becomes thoroughly œdematous, the serous effusion will begin to invade the interior cavities and organs of the body; usually, first filling up the peritoneal sac to such an extent as to impede the descent of the diaphragm, adding greatly to the oppressed and difficult breathing, giving to the patient an almost constant sense of impending suffocation, and terminating finally in one of two ways:—One is by simple extension of the œdematous infiltration into the pulmonary tissue, rendering the amount of air capable of entering the lungs so small that the lips become blue, the extremities cold and purplish, the cutaneous surface covered with a cold clammy sweat, extreme sense of suffocation is felt, and a speedy death from apnœa ensues. The other is by failure of the kidneys to secrete urine, allowing the elements of the urine to be retained in the blood until their toxæmic effect upon the nervous centers induce muscular twitchings, drowsiness, irregular and labored breathing, gradually increased to stupor, and finally coma and death.

In some of these cases, during the progress of the supervening coma, convulsions occur, sometimes partial but more frequently general clonic spasms repeated once or twice, and ending in complete coma, relaxation of the sphincters and death. An impression is very general among the people that organic disease of the heart renders them liable to sudden death at any moment. But so far as relates to death from disease of the valves of the heart, originating from attacks of endocardial inflammation, death is rarely sudden. In much the greater number of this class of patients death approaches slowly, leading them through a protracted period of great difficulty of breathing, the constant sense of suffocation and weariness being of such a character that many of them long for death to take place weeks before their longing is gratified. I have spoken of the symptoms of endocarditis with reference to the separate cavities of the heart and the valvular structures, and, as you will have observed, my references have been almost entirely to the left cavities, with the mitral and semi-lunar valves of the aorta. The reason for this is the clinical fact that endocardial inflammation very rarely invades the right cavities of the heart, whatever may be the physiological reason, whether it is from the sedative effects of the increased amount of carbonic acid in the venous blood with which the right cavities are filled, or some other cause, all observations show that we have at least fifty cases of endocardial inflammation in the left to one in the right cavities of the heart. But the remote consequences of these inflammations, especially when they leave such a condition of the mitral valve as to seriously obstruct the auriculo ventricular openings of that side, or cause mitral stenosis as it is called, are not restricted altogether to the left cavities of the heart; but in many cases of protracted duration the long continued obstruction to the passage of blood through the capillary vessels of the lungs leads to habitual over-fullness of the pulmonary arteries, and ultimately more

or less of the same increased fullness in the auricles and ventricles of the right side of the heart. Most of the post mortem examinations of this class of cardiac diseases reveal decided hypertrophy or increased growth of the muscular walls of the left ventricle, with diminished size of its cavity, while the right ventricle and auricle are both dilated with thinning or atrophy of the muscular walls. And usually the dilatation of the right auricle and ventricle also includes with it an enlargement of the auriculo-ventricular opening, rendering the tricuspid valve insufficient for its office, and consequently allowing the regurgitation of blood through it with each systole, giving what is familiarly known as the venous pulse or regular pulsation in the veins of the neck. Such are the more common anatomical changes which result from the different grades of endocardial inflammation, involving the valvular structures, and leaving them more or less permanently incapacitated for fulfilling their natural office.

Diagnosis.—The symptoms and physical signs by which we are enabled to detect the beginning, and the progress through its subsequent stages, of myo- and endocardial inflammation, have been so fully stated in giving the clinical history of the disease and its ultimate results that I need not re-enumerate them under this head. The principal liability to mistake is in reference to confounding the bellows murmur of endocarditis, when of a moderate degree of intensity, with the anæmic bellows murmur that is met with frequently as the accompaniment of the more strongly marked anæmic or impoverished conditions of the blood, unconnected with any inflammatory action. And, it is a matter of much importance to be able to distinguish between these two conditions. The principal distinctions are, that the anæmic murmur is always synchronous with the systolic action of the heart, and is never sufficiently prolonged to obliterate the interval between the first and second sounds; but always leaves an appreciable interval between them. It is in fact a mere blowing or exaggeration of the first sound of the heart, its quality neither indicating roughness, or harshness, nor anything of a regurgitant character. Another characteristic of the anæmic bellows murmur, is its being heard as loud and plain, and sometimes even more prominently, over the course of the aorta as high up as the arch and over the sub-clavian arteries, as over the body of the heart itself. If you remember these qualities, with the rigid restriction of the morbid sound to the first sound of the heart, its softness rather than harsh quality, and its equal development over the large arteries, and the further fact, that these anæmic murmurs are in subjects plainly, either chlorotic or deficient in the red matter of the blood, you will hardly be liable to make any mistake in your diagnosis. I may add, however, as an almost constant fact, that in endocardial inflammation and its consequences the pulse has a pretty uniformly firm, sustained feeling of tension: whereas, in the anæmic conditions of sufficient degree to cause a bellows murmur, the pulse though often excited, quick and having the appearance of volume, is nevertheless soft and easy of compression.

Prognosis.—The prognosis in endocardial inflammation so far as direct danger to life is concerned is generally favorable; but in relation to the prospect of having complete recovery without embarrassing sequelæ, the prognosis is not so favorable. A very large proportion of all the cases of endocardial inflammation pass through the active stage of the disease with safety, and the patient convalesces. In many of them the recovery is complete. A large proportion of the cases are nevertheless left with some degree of permanent thickening of the valves, which constitutes the beginning of that slow morbid process called sclerosis, or increased growth of the connective tissue, which will either moderately embarrass them on

taking active exercise through life, or lead to some of those more serious structural changes that I have already described as ultimately terminating the life of the patient. Still there are cases of endocarditis of such severity as to cause death during the active progress of the disease.

Treatment.—In Lecture XXXI of the present course, when speaking of the treatment of acute articular rheumatism and rheumatic fever, I spoke freely of its liability to become complicated with both pericardial and endocardial inflammation. When discussing the treatment of that grade of rheumatism, I called your attention to the additional treatment that might be required for the acute stage of these cardiac affections, consequently it is not necessary to repeat the directions then given at this time. (See Lecture XXXI, p. 299.) But the remarks then made were limited to the treatment during the acute stage of the progress, both of the general rheumatic disease, and of the local cardiac complications. The latter, however, are very liable to be continued in what may be styled the chronic form, more especially when, during the acute stage, the valvular structures have become thickened and indurated to such a degree as to materially interfere with the circulation of the blood. It is then difficult to define precisely when the inflammatory action in these cases has ceased, and we have only to deal with the consequences, in the form of structural changes which the preceding inflammation has induced. But so long as there are obscure dull pains in the cardiac region, and slight increase of temperature of the body, with some degree of scantiness in the urinary secretion, it may be safe to assume that some degree of inflammatory action still exists in the cardiac structure. This inference will be corroborated in a greater or less degree by the evidence of chronic rheumatic inflammation in the articulations, or other fibrous structures in any part of the body. So long as evidence of inflammatory action remains, however moderate in its degree, there is a tendency to increase or hypertrophy of the connective tissue in the valvular structures, and increase in their density, thereby rendering it almost certain that the structural changes will become permanent unless counteracted by persistent treatment.

It is better, therefore, to err sometimes by continuing treatment designed for the removal of these low grades of inflammatory action too long, rather than omit it too early. The most efficient treatment during the latter stages of the endocardial inflammation, or what might be called its chronic stage, consists in the administration of remedies which have a two-fold effect, one to lessen the frequency of the heart's action by lessening the irritability of its muscular fibers, and the other to overcome the morbid excitability of the inflamed structure and to prevent the further atomic or cell changes which take place in all persistent low grades of inflammatory action and constantly tend to increase by hypertrophy the connective tissue and endothelial layer of the membrane. For these purposes in the stage of the disease now under consideration, I have seen much benefit produced by the administration of the iodide of potassium in connection with stramonium. A convenient formula would consist of the following:

℞	Potassii Iodidi,	10 grams.	ʒiiss
	Tincturæ Stramonii,	12 c. c.	ʒiii
	Tincturæ Digitalis,	30 c. c.	ʒi
	Syrupus Simplicis,	15 c. c.	ʒss
	Aquæ Distillatæ,	60 c. c.	ʒii

Of this formula four cubic centimeters or one teaspoonful may be given

to the patient every four or six hours, according to the effects of the digitalis upon the motions of the heart. At the same time it is desirable to continue the use of the alkaline carbonates, either of potassium or sodium, with sufficient degree of freedom to prevent the urine from again becoming more than normally acid. These remedies will usually keep the urinary secretion free in quantity, lessen the cardiac excitement, favor the disappearance of what rheumatic pains and soreness may still be lingering in any part of the system, while the alterative effects of the iodide are particularly calculated, not only to prevent further inflammatory exudation into the valvular textures, but to aid in causing the disintegration and removal of such as have already taken place.

In some of these cases, the bowels remain costive unless they are prompted by some laxative. In such cases a pill composed of blue mass, extract of hyosciamus, and aloes six centigrams (gr. i) each given at night will usually produce a moderate evacuation in the morning, which is all that is necessary. I have seen some cases of endocardial inflammation arising in the progress of acute rheumatic disease in which the faithful and somewhat persistent use of the remedies here indicated was followed by an entire removal of the physical signs of valvular thickening, and of all obstruction to the free circulation of the blood through the various cavities and openings of the heart. On the other hand it must be acknowledged that there are many of the cases which resist all efforts to remove these inflammatory changes. The consequence is, that the patient recovers sufficiently to resume more or less attention to business, or ability to take moderate exercise indoors and out, but yet, the cardiac murmurs remain, the pulse retains the characteristic qualities that belong to obstructions in the mitral and aortic openings, and the patient sooner or later again finds himself incapable of taking active exercise or of ascending stairs without feeling oppressed in breathing, with increased frequency and irregularity of the heart's beat. The question how best to manage these cases for the purpose of preventing ulterior changes in the cavities of the heart and their consequences, is one of much practical importance.

My own experience has led me to think the practitioner should give special attention to the accomplishment of three objects in the management of such cases:—First to carefully instruct the patient in regard to the importance of so regulating his daily habits of life as to avoid, as much as possible, all mental excitement or anxiety on the one hand, and hurried or exaggerated physical exercise on the other; such occupations as will afford his mind employment without intensity of application or much anxiety in regard to the results to be obtained, and the regulation of exercise in such a way as to enjoy the open air passively by riding and moderate walking, but avoiding the ascent of hills and steep places out of doors, and, as much as possible, the stairs within doors. Whenever the latter is attempted it should be done with much deliberation and slowness. In other words the patient should be instructed to do all his work, both mental and physical, in quietude, and entire freedom from hurry or violent exertion. By such a regulation of the daily habits very much will be gained in retarding the progress of the cardiac changes. The second important object to be accomplished is the use of such remedies as will be most efficient in keeping the frequency of the heart's beat as near the natural standard as possible. When the mitral valve performs its office imperfectly or the auriculo-ventricular opening is contracted, constituting mitral stenosis, the more frequent the systolic action, the less time there is for the blood to pass from the auricle through the narrow opening into the ventricle. Hence it is that every excitement or exertion that quick-

ens the systolic action in such patients brings oppression in breathing, and quickly causes them to demand rest. If the systolic action can be rendered slow, leaving the full length of interval between the systole and diastole, the blood passes in larger quantity through the narrow opening, the ventricle becomes better filled, a fuller volume of blood is sent to the system at large, and the pulmonary circulation is relieved. It is desirable however, in selecting remedies for those cases, that they be such as will render the action of the heart slower without impairing its force.

It is also desirable that they should be exempt from liability to disturbance of digestion or interference with the functions of the stomach. You will perceive that the cardiac sedatives, such as veratrum viride, aconite, and gelsemium, are not well adapted to these cases. For, while they are efficient in rendering the heart's action slower, they tend both to diminish the muscular force, and to disturb the functions of the stomach, unless they are administered with great caution. Digitalis, cactus grandiflora, and convallaria, are almost the only remedies with which we are familiar that possess all the desired qualities, and can be used for the required length of time in such a way as to regulate the heart's action and greatly ameliorate the condition of the patient, and at the same time retard the ulterior changes to which such cases are always liable. In many instances I have used a combination of one part of the tincture of digitalis with two parts of the fluid extract of scutellaria, giving of the mixture two cubic centimeters (min. xxx) every four or six hours until a perceptible slowing of the cardiac action was obtained, when from two to three doses in the twenty-four hours would usually perpetuate the effect desired. The fluid extracts of the cactus and of the convallaria have not been sufficiently tested in these cases to justify me in speaking very positively of their effects.

I think they are less reliable than digitalis, but may be used for a longer period of time without danger of accumulating and suddenly developing exaggerated effects, as digitalis occasionally does. The third object which the practitioner should keep in view in all these cases, is the regulation of the diet, clothing, and other hygienic conditions of his patient, with a view of preventing the recurrence of rheumatic attacks during the transition seasons of the year, to which almost all such cases are more or less liable, and which seldom fail to increase the local cardiac changes. This object will be accomplished best by requiring the patient to wear flannel or other good non-conductors of heat and electricity next to the surface during all the year, unless it be a few weeks in the middle of the summer when it should be exchanged for the lighter canton flannel. Another item of a hygienic character of much value to such patients is the use of a warm alkaline bath once or twice a week, particularly during the cold season of the year, from the first beginning of the cool and the wet weather of autumn, until the return of the following summer. These baths may consist simply of warm water holding in solution sufficient of the carbonate of sodium or potassium to render them alkaline, and after the patient has been immersed in the bath as long as is comfortable, on removal, the water should be wiped quickly from the surface with ordinary towels, and the whole cutaneous surface briskly and rapidly rubbed with dry soft flannel. In this way the skin can be kept healthy and active, which constitutes the most efficient safeguard against the accumulation of the lactic acid or other materials in the blood supposed to be capable of causing rheumatic inflammation. I have seen many patients who by systematic careful management on the principles I have indicated, have passed from ten to thirty years of life with a reasonable degree of comfort, and have been able to

pursue successfully their ordinary occupations after the establishment of permanent cardiac murmurs.

One of them, a lady, has during the time reared a family of children, superintending her own household, always preserving calmness and quietude in her movements, mental and physical; and though many times laid up temporarily with fresh rheumatic attacks of a mild character, involving each time increased cardiac excitement and some increased bellows murmur, yet warding them off by such means as I have indicated, she continues still able to endure a moderate degree of walking, any amount of riding, and to enjoy life to a reasonable extent. But if these cases are not carefully guided by accurate instructions, much the larger proportion of them will have their cardiac troubles increased two or three times during every cold season of the year, and they speedily reach that degree of exaggeration which brings general dropsical infiltration, and entire failure of the patient.

Inflammation of the Aorta.—Acute or sub-acute inflammation of the lining membrane of the aorta rarely occurs except in direct connection with endocarditis. I have seen a few cases, however, that occurred during the progress of acute rheumatic attacks in which all the physical signs of thickening of the membrane lining the aorta, such as harsh rough sounds in connection with the systolic action of the heart, decided sense of oppression, distress in the chest behind the sternum, and, as the cases progressed, more or less difficulty of breathing, decided expression of anxiety in the countenance, and an exaggeration of the pulsations in the carotid and sub-clavian arteries indicative of actual inflammatory action in the larger vessels, and yet close examination by auscultation failed to detect the cardiac sounds characteristic of endocardial inflammation. The rough sounds heard over the aorta at different points from the semi-lunar valves at its opening to its arch, were not detected over the body of the heart, or at the apex. In one of these cases to which I allude, the patient being under my care in the hospital, there occurred indications in connection with it, of a moderate degree of pneumonic inflammation in the left lung. The case proved fatal about the end of the second week of the rheumatic affection, and I think on the seventh day after the physical signs indicated involvement of the aorta. When inflammation takes place in the lining of the aorta, it produces the same changes anatomically, that take place in the interior of the cavities of the heart. The membrane, or parts of it, become thickened and often studded with little prominences made up of the proliferating endothelial cells, and sometimes apparently springing from the deeper layers of the connective tissue.

Very few of these cases have terminated fatally during the active stage. I am quite sure that I have traced a few of them, however, in their subsequent course to the establishment of permanent rough places in the interior of the aorta, causing harsh rough sounds synchronous with the systolic action of the heart, keeping up more or less feelings of oppression and fullness in the chest which were much increased by exercise. It is highly probable from the appearances found on post-mortem examinations that these rough places are patches of increased thickening of the structure, and which in time present more of an atheromatous character. It is also probable that in some instances these atheromatous changes extend deep enough into the arterial coats to impair their strength and thereby prepare the way for the development of future aneurismal dilatations. The treatment in these cases of inflammation in the aorta is similar in all respects to the treatment of the same grades of endocardial inflammation.

Acute Ulcerative Endocarditis.—There is still another form of inflammation affecting the endocardium requiring a brief notice. It has been recognized as a distinct form of endocarditis only the last few years. I allude to what some recent writers have styled "acute ulcerative endocarditis." It occurs chiefly as a complication in the advanced stages, or during the early part of convalesence, of the general acute infectious diseases; such as diptheria, pyæmia, typhoid fever, and probably never occurs as an idiopathic affection unless preceded by some form of blood poisoning. The symptoms of the disease are often obscure so far as the inflammation of the heart is concerned. Generally the first noticeable symptoms are the chill, followed by an unusually high fever, the temperature rising rapidly to 40°—40.5°—41° C. (104–5—6° F.), the pulse becoming exceedingly rapid, soft or easily compressed, feelings of great prostration, not unfrequently vomiting, accompanied by extreme distress in the epigastrium, and in other instances diarrhœa, and occasionally diarrhœal discharge mixed with blood. The urinary secretion becomes very scanty and in most cases more or less albuminous. The progress of these cases is usually rapid; the patient, more generally on the second or third day, becomes delirious, pulse small, thready, extremities cold and bluish; in some cases purpuric or hemorrhagic spots appear upon the surface, particularly over the abdomen and inner surface of the thighs; the heart's action is very weak, at times intermitting and sometimes tumultuous, but generally growing hourly more feeble till the patient sinks into a drowsy, or comatose condition and dies. There are some cases, however, in which the symptoms are less severe and the progress less rapid, presenting some resemblance in their clinical phenomena to the more severe grades of typhoid fever. In others, they have been so similar to the progress of cases of pyæmia and septicæmia that no differential diagnosis has been made during life. Even auscultation, here, does not always furnish the bellows murmur, or the altered sounds which are characteristic of inflammation in the interior of the heart. In one or two instances that have come under my own observation, in which the patients were not seen until the disease was near its fatal termination, the cardiac action was so weak and rapid as to render it impossible to analyze the sounds. It was easy to determine that they were abnormal, that there was an unnatural condition of the interior of the heart, but I could not distinguish clearly the sounds belonging to different parts of the rhythm of the heart.

This form of endocarditis pretty uniformly terminates fatally. The anatomical changes that accompany it, are found to consist of little reddish and sometimes gray granules, sometimes arranged in rows on different parts of the interior surface of the left ventricle. Generally these granules are more readily seen on either the mitral or the semi-lunar valves of the left side of the heart. The granules are easily rubbed off, leaving the surface on which they rested covered with minute ulcerations. Sometimes these ulcerations enter quite deeply into the valvular structure. A few instances have been observed in which they had penetrated through the whole depth of the valve, causing perforations. In more cases they had penetrated only deep enough to weaken the valves and cause a bulging, and sometimes aneurismal dilatation. When the mitral valves have been thus weakened the bulging is toward the auricle ; the same change taking place in the semilunar valves, the bulging is toward the cavity of the ventricle. Microscopic examination of the granulations I have mentioned, and also the surface of these ulcers, and often in part of the structure constituting the interior of the heart, shows the presence of great numbers of the spheri-

cal bacteria or micrococci. They seem to exist in clusters; indeed the apparent granules are largely made up of collections of these micrococci, at the same time they are found in large numbers in the blood taken from any part of the body, and generally may be found also in the other tissues. How far they have any causative relation to the end ocardial disease is not known. This form of endocarditis has not been definitely diagnosticated except in those instances where the blood of the patient was contaminated with some form of septic or poisonous material.

And in all such cases, more or less of the bacterial forms have been found present wherever microscopic examinations have been made by those competent to observe. Yet their presence in these cases by no means justifies the conclusion that they are the cause of the disease, either of the blood generally, or of the local affection of the heart. A very interesting and marked complication which occurs with many of these cases of acute ulcerative inflammation of the endocardium, is the formation of multiple abscesses; not in the heart structure, but they are found in distant organs. The organs most frequently exhibiting these small abscesses are the spleen, kidneys and liver. Whether such abscesses are produced by the invasion of some of these detached granules containing the micrococci, or by minute emboli formed in the heart, or whether they originate from the same condition of the blood which had produced the endocardial disease, investigation has not determined. Neither is it a point of much practical importance. As I have stated these cases of ulcerative endocarditis have thus far uniformly terminated fatally; no treatment having proved successful, and from the very nature of the case there is no reasonable probability that treatment will ever succeed in correcting the morbid condition in time to prevent the death of the patient. The most important direction to be given in regard to the management of these cases, is the use of such remedies in each individual case as the more prominent symptoms may indicate; always keeping in mind that the liberal use of such antiseptics and germicides as can be introduced into the blood rapidly and with safety, and in addition such remedial agents as directly tend to support the strength of the patient, and as far as possible maintain the nutritive processes, will afford the best chance, both of palliating the patient's condition, and producing recovery, if the latter were possible. In other words the treatment is really the same as that which is required in the more severe cases of pyæmia and other well known forms of blood poisoning. I have now completed the consideration of the inflammations liable to affect the central organs of the circulation.

LECTURE L.

Inflammation of the Organs of Digestion; the several parts or structures included—Inflammatory affections of the mucous membrane of the mouth and fauces and its appendages; their clinical history, diagnosis and treatment.

GENTLEMEN: The digestive apparatus includes the mucous membrane of the mouth and fauces, the salivary glands, the tonsils, the tongue, œsophagus, stomach, duodenum, small intestines, colon and rectum, togeth-

er with the glandular organs connected therewith, the more important of which are the liver, spleen, pancreas and mesenteric glands. Inflammation in its various grades of activity may occur in any and all of these portions separately, or it may occur in several of them simultaneously. I shall consider them, however, as they relate to each of the prominent divisions of the apparatus already mentioned, commencing with the mouth.

Stomatitis.—Many writers use the word stomatitis to designate all the various grades of inflammation in the mucous membrane of the mouth. For practicable purposes, we may include these several inflammatory conditions under the following heads: Diffuse or superficial inflammation, apthous and follicular, mercurial, nursing, scorbutic, ulcerative, and gangrenous. The first grade of inflammation mentioned, that of diffuse superficial inflammation of the membrane lining the mouth, occurs in two essentially distinct conditions of the system. The first is the result usually of the action of some local irritant applied directly to the membrane itself, and may occur in any or all classes of subjects. The taking into the mouth of substances at too high a temperature, producing slight scalds or burns; the use of irritating liquids, or anything in contact with the membrane of the mouth which is capable of producing irritation, may cause this form of disease. It is much more frequently caused by the simple taking of liquids too hot, and the incautious use of certain acid substances not sufficiently diluted. The symptoms which accompany this form of inflammation are a sense of heat, at first dryness, followed by increased flow of saliva, and soreness of the inflamed membrane, while to the eye it looks red, and slightly tumefied. There are some substances capable of exciting superficial inflammation of the membrane when applied to it, that instead of being followed by redness, seem to contract the vessels of the surface and so alter it as to cause increased paleness or a white instead of a red and congested appearance. Such is the case with the application of carbolic acid of sufficient strength, and of creasote. When the inflammation is simply of a superficial character, arising from any of the various causes to which I have alluded, it usually runs its course and subsides with little or no treatment in a few days. When it is more severe, however, and the services of the physician are required, on account of the intensity of the hot, burning, smarting pain, and the inconvenience that the patient suffers, one of the best remedies will consist in use of a cold mucilaginous infusion to be held in the mouth as much of the time as the patient can make convenient. The mucilage of the gum arabic, ulmus fulva, or of symphytum officinale (comfrey) rendered cold by small pieces of ice, are among the best applications that can be used locally. After the first stage of the inflammatory action is passed and the heat and smarting pain are less severe or have passed away, if there is left some blush of redness, with tenderness, or the contact of food is painful, with a disposition to excessive flow of saliva as sometimes happens, from the orifices of the salivary ducts being involved in the inflammation, an infusion prepared by putting the coptis or gold thread root and sage leaves each four grams (℥i) and borate of sodium six decigrams (gr. x.), into an ordinary tea-cup, two thirds full of boiling water, to which may be added a little white sugar or honey, and the mouth freely rinsed or gargled with it every three or four hours during the day will give additional relief. If at any time during the progress of the case the patient's bowels are found to be inactive, or if any feverishness is manifested, it will be well to give a dose of some saline laxative, sufficient to procure from one to three intestinal evacuations. In the great majority of cases any one of the local remedies I have named, together with the use of

as bland, unirritating nourishment as possible, will constitute all the treatment that will be needed. The other variety of diffuse superficial inflammation is limited in its occurrence almost entirely to patients suffering from imperfect nutrition. The great majority of cases are in young children, commencing before the end of the first week after birth; and are caused by a failure of nutrition, either from the reception of an insufficient supply of milk, or an inability to assimilate what it does receive. Under such circumstances, somewhere from the second to the fifth day, the child's mouth begins to show a general increase of redness of the mucous membrane, and during the next twenty-four hours this membrane will become dotted over with small specks of a white curdy exudation upon the surface; or it may be so completely covered with the exudation as to render the whole surface of the mouth, gums, edges of the tongue back to the fauces, completely white. But if there are any places where this white covering is either detached or scraped off, the membrane itself will be seen red and slightly tumefied. This condition of the mouth in nursing children is familiarly called *thrush;* and by the French, *miguet.*

In many of them, soon after this condition of the mouth appears, the the skin shows a peculiar sallow hue somewhat resembling jaundice, and dark purplish red spots make their appearance upon the skin, more particularly over the face and upper part of the chest. When this alteration of color in the cutaneous surface and the red spots appear, the nurses call it *red gum.* Most of the children suffering from the disease to the extent I have indicated, are drowsy or inclined to sleep, sometimes to such an extent as to make it difficult to arouse them sufficiently to take nourishment either by nursing or from the spoon when fed. Very generally, the bowels are at first inactive, the urinary secretion scanty, and in some instances suppressed.

My attention was called to a child only three days old, a few weeks since, in which the bowels had not moved for forty-eight hours, and there had been no secretion of urine whatever during the whole period of time. The child was exceedingly drowsy, had all the symptoms of thrush and the red spots upon the skin which I have mentioned, but gave no signs of uræmic disturbance except an occasional sudden starting from the drowsy condition, and immediately lapsing into it again. In most of these cases, about the third day after the appearance of the curdy exudations upon the surface of the membrane lining the mouth, it begins to disintegrate, and during the next two or three days it usually disappears. If the patient has been improving as these exudations disappear, the membrane of the mouth then shows more nearly a natural color; the breath is free from offensiveness, and all the symptoms of disease speedily disappear. But in cases in which the cause of the difficulty has not been removed, the disappearance of the curdy exudation is accompanied by a slight offensive odor, with superficial abrasions of the mucous membrane, particularly along the edges of the tongue, the gums, and sometimes on the inside of the lips and the central part of the cheek, constituting the slightest form of the ulcerative abrasions of the membrane of the mouth. The other circumstances in which this same form of inflammation of the mouth occurs in adult life, are extreme emaciation from the influence of some pre-existing disease, such as tubercular phthisis, chronic diarrhœas, dysentery, or any other form of disease that is capable of producing extreme impoverishment of blood and wasting.

When this stage of extreme impoverishment supervenes, in the progress of wasting diseases the patient generally complains first of simple tenderness and heat in the mouth, as if it had been slightly burned. On inspec-

tion, the membrane covering the fauces and usually the edges of the tongue, will be seen unnaturally red, with small patches of a white curdy exudation on its surface. In some cases these patches increase in size until, as in the very young children, a large part of the membrane becomes white with it. In this class of cases the disappearance of the exudation is almost always followed by more or less destruction of the membrane, leaving irregular superficial ulcerations, which cause the patient much inconvenience and suffering in attempting to take food and drink. The disease in these cases has no natural tendency to recovery or is not self-limit in duration unless the associated general disease which has led to the impoverishment is capable of removal; when this is the case, the disease in the mouth ceases spontaneously, simply from the removal of its cause. As both the thrush or curdy sore mouth of infancy, and that which occurs in adult life, originate from defective nutrition, the primary object of the treatment must be to restore this process to the healthy natural standard of activity. All local applications will be merely palliative in their effects. In young children the most important item in their management is to secure for them a good supply of healthy mother's milk. If the natural mother, from defects in the nipples, or from inflammation affecting the mammary glands, or any other cause, is rendered incapable of furnishing the necessary nourishment to the child, it will be of great advantage if a healthy wet nurse can be found to take her place. When this is inconvenient or impracticable, the next best resort is the use of fresh, pure cow's milk, to which may be added a tablespoonful of lime water, to each teacupful of milk, and just enough of either sugar of milk, or ordinary white sugar, to give it a slightly sweetish taste. By this degree of dilution, and the addition of a small proportion of sugar, the composition of the cow's milk is brought as near to that of the mother's or human milk as can be conveniently done; while the use of the lime water as a dilutent, instead of pure water, gives the additional advantage of rendering the coagulation of the casein in the child's stomach slower, and therefore less likely to occur before absorption can take place.

In the absence of the ability to nurse, the rule for feeding the child should be to give it just such quantities, and with such frequency as will appear to satisfy its appetite. I know of no arbitrary rule that can be given for the frequency of feeding infants. They differ much, one from another, in the frequency of their demands for food. Usually, when they are well supplied, they will be quiet, good-natured, and rest well. But if not fed enough, or fed on material so diluted that the tissues are starved when the stomach is full, they will persistently cry or worry until they have a better supply. And yet both mothers and nurses sometimes mistake the crying as indicative of colic, and dilute the food still more, only to be annoyed by the increased restlessness and worrying of the child. After providing the child with an adequate amount of some proper form of nourishment, the only other remedies required, usually, are such as will secure a moderate movement of the bowels about once in twenty-four hours, and promote the renal secretion where this is defective, internally, and the application of some very mild, slightly astringent solution to the mouth. The best laxative in most cases where this is required consists of an infusion of manna, anise seed, and soda. Four grams (℥i) of manna, half that quantity of anise seed, bruised, and five decigrams (gr. viii) of bicarbonate of sodium may be put into one hundred cubic centimeters (℥iii) of water boiling hot; stir it up frequently till it is cool; add a little white sugar, and feed the baby a teaspoonful of this infusion every two hours till the bowels are moved. If the kidneys need prompting, the

addition of from one to two minims of nitrous ether (sweet spirits of nitre) to each dose of the laxative will have the desired effect. After the bowels have been moved once or twice, and the urinary secretion rendered sufficient, if the child appears debilitated, with coldness of the extremities, from two to five minims of the compound tincture of cinchona may be given in half a teaspoonful of sweetened water every four or six hours. For local application to the membrane of the mouth I have found nothing more beneficial or more easily applied than a powder composed of alum six decigrams, saccharum alba (white sugar) eight grams, a small portion of which on the point of a penknife may be passed into the mouth of the child, or be placed upon the child's tongue, three or four times a day. The powder quickly dissolves and diffuses itself into the mouth more perfectly, and consequently becomes applied to the inflamed surface more efficiently than can be done by any process of swabbing which is so frequently resorted to by nurses in these cases. Indeed, the frequent introduction of the ordinary swab for applications in this class of cases is usually productive of much more harm than good, from the mechanical irritation induced.

No apprehension need be felt concerning the child's swallowing the dissolved powder, for the small portion of alum that would be contained in any one of the applications would have no perceptible effect upon the child's stomach. Usually the exudations rapidly disappear under this treatment, no ulceration follows, and no additional local applications are necessary. If, however, as occasionally happens, the disappearance of the exudation is accompanied by more or less offensiveness of the breath and saliva, and the membrane remains tender, or slightly abraded, it will be well to have the affected surface wet three or four times a day with the infusion of coptis or gold-thread, sage, and borax, to which I alluded a few moments since. In those cases of this variety of sore mouth occurring in the advanced stage of wasting diseases, the same local applications will be found as beneficial as any that can be used. The internal treatment must be guided entirely by the more prominent disease which has occasioned the emaciation and suspension of nutrition.

Follicular Stomatitis.—By *follicular inflammation* of the mouth is meant those cases in which the inflammation is limited to the follicles instead of its diffusion over the membrane generally. This form of inflammation is indicated by the appearance on some portions of the fauces, inside of the cheeks, inside of the lips, and on the tongue, of little red prominences accompanied by a sense of heat, tenderness on taking food and drinks into the mouth, and generally, after the first day, an increased flow of saliva. If the follicular disease has resulted, as is often the case, from derangements of the functions of the stomach and the processes of digestion, it will speedily disappear whenever these derangements are corrected. In most instances its natural tendency is to continue no more than from three to five days and disappear, leaving no ulcerations or abrasions of the membrane. Another variety of inflammation more troublesome, from its tendency to be more protracted in its duration than the follicular, has been termed aphthous inflammation of the mouth. This appears, first, in the form of distinct vesicles, generally strictly oval, varying in size from a millet seed to the circumference of a small pea, filled at first with a transparent rather viscid fluid. If examined during this follicular stage there will usually appear a slight areola of redness, directly around the base of the visicle.

In the slightest forms of the disease, not more than one or two of these

vesicles will appear at a time in the mouth. In other cases there may be three, four or five vesicles closely aggregated together, constituting a group, or there may be several of these groups in different parts of the mouth. Perhaps they more frequently appear on the inside of the lips and cheeks than elsewhere. When they occur in clusters, the inflammation is more severe; not only causing redness in a narrow areola around their base, but causing some actual tumefaction and slight hardening of the parts on which the vesicles rest. The walls of the vesicles are usually broken by the motions of the mouth, in taking food, within the first twenty-four or thirty-six hours after their appearance. When the walls of the vesicles have broken and disappeared there is left a slightly excavated ulcer, with usually irregular edges, its surface being covered with a very thin white exudation; giving it the appearance of an excavated irritable ulcer, surrounded by a narrow line of redness. These are extremely irritable, causing a feeling of burning, smarting, stinging, greatly aggravated whenever the patient makes those movements necessary in talking or taking food and drink. In most cases they soon manifest a tendency to undergo repair and cicitrization, and make sufficient progress to render the process of recovery complete in from five to nine days. Where they occur, however, in patients affected by an unhealthy constitutional condition, whether scrofulous, or simply impaired by bad sanitary surroundings, such as residence in impure air, damp, and cold rooms, and the use of indigestible, or insufficient nourishment, the ulcers left by the disappearance of a group of vesicles under such circumstances, instead of putting on a granulating aspect and progressing toward recovery, slowly spread until sometimes they occupy the whole diameter of the inside of the cheek, or a large portion of the inner surface of the lip; keeping up a constant flow of saliva, accompanied by some degree of offensiveness of the breath and of the salivary secretion. Nearly all the cases of apthous inflammation of the mouth have for their cause derangements of the digestive organs of such a character as to produce an undue amount of acidity of the stomach, generally associated with constipation, though occasionally the reverse condition of the bowels will exist.

The treatment required both for the follicular and apthous forms of inflammation in the mouth, should have for its object, first, the correction of whatever derangements in the function of the stomach and digestive apparatus may exist, the removal of the patient from whatever bad sanitary conditions he may be placed in, the supply of a sufficient quantity of good, easily digested food, and such local applications as will directly diminish the morbid sensitiveness of the inflamed follicular or apthous ulcers, and establish a new or healthier molecular movement in them. In the simple follicular grade of inflammation mucilaginous or slightly astringent washes will constitute all the local applications required. But the apthous ulcers, after the vesicles are broken, will be most speedily changed to a condition of repair and freedom from sensitiveness or pain by touching them once or twice in the twenty-four hours with a smooth pencil or crystal of the sulphate of copper. Placing the smooth surface of the solid sulphate of copper for one or two seconds directly upon the surface of the apthous ulcer, while it produces momentary smarting, is almost invariably followed in the course of an hour by a great mitigation of the burning, and all other painful sensations. Repeating this application once or at most twice a day for the first three days is usually sufficient to cause a rapid disappearance of the ulcer. Many recommend an application of a pencil of nitrate of silver to the surface of these ulcers instead of the sulphate of copper. And many use, instead of either mildly

astringent and antiseptic washes, such as solutions of the sulphate of zinc, sulphate of iron, permanganate of potassium, or some one of the vegetable astringents. Of these, the nitrate of silver is by far the most efficacious. But, so far as my observation goes, this is not as uniformly and promptly beneficial as the application of the sulphate of copper in the manner I have already mentioned. It generally blackens whatever it touches, making it very unpleasant to use, and as it possesses no advantage in a curative aspect, over the sulphate of copper, the latter should be preferred. Many of these apthous ulcers may be relieved, though a little less speedily, by touching them with a crystal or pencil of the sulphate of aluminium (alum). If this is used it should be held in contact with the ulcerated surfaces a longer time than the sulphate of copper; but it will not be found as promptly beneficial.

Mercurial Stomatitis.—In former years, when the mercurial preparations were much more freely used in the treatment of disease than at the present time, a severe inflammation of the mucous membrane of the mouth, gums and fauces, was not unfrequently induced, and was known by the familiar name of salivation. There are a few persons possessed of such idiosyncrasy, that even the smallest quantity of mercurials taken internally will speedily result in the establishment of an inflammation in the mucous membrane of the mouth, together with more or less irritation of the salivary glands. But, without any such idiosyncrasy, it is well known that the continued administration of small doses of mercurials, more particularly of the mild chloride, blue mass, and the iodides, is liable to develop this inflammation to a greater or less extent. The first symptoms of the presence of this form of inflammation are tenderness in the sockets of the teeth, a peculiar fetid odor of the breath, and a slightly swollen and bluish line along the edges of the gums around the teeth. The observant practitioner may frequently detect this odor of the breath, and note the change in the appearance of the edge of the gums before the patient has suffered sufficient inconvenience to attract his attention. But, from this slight beginning, if the remedy has been administered in sufficient quantity and suffered to accumulate in the system, the inflammation will extend over the entire mucous membrane of the mouth, causing it to become reddened and swollen, with tumefaction of the tonsils and fauces, and an increased flow of saliva.

In bad cases, four or five days after the commencement of the inflammation, a large portion of the teeth will be found loose, the gums swollen and commencing to ulcerate, with superficial ulcerations along the inside of the cheeks and lips and over the fauces, which together with the swelling of the salivary glands, will often impede the opening of the mouth beyond a very limited extent, and occasion a constant flow of saliva. There is a sense of heat, burning, and often decided pain, particularly in the fauces, along the roots of the teeth, sometimes radiating through the branches of the nerves supplying not only the teeth, but the sides of the face, even up through the temples and backward over the mastoid region. In the more severe cases the tongue partakes of the inflammation and becomes much swollen; adding to the difficulty of swallowing or taking either nourishment or medicine; sometimes preventing the patient from closing his mouth, and keeping the swollen tongue constantly protruding beyond the teeth and suspending the ability to perform deglutition, as well as occasioning considerable difficulty in breathing. In all these cases the breath and saliva have a very offensive odor, so peculiar as to be at once recognized by the practitioner as diagnostic of this form of disease. When the mercurial, which has been the cause of the disease, has not been

administered after the supervention of the symptoms of salivation, the usual tendency of the inflammation is to reach its climax of severity in from three to five days after its commencement. In the milder class of cases soon after this, it spontaneously begins to decline, all the unpleasant symptoms diminish from day to day, and at the end of the second week the mouth will generally have returned to its natural condition. In the more severe cases, however, the climax of the tumefaction of the tongue, and parts inflamed throughout the mouth, will not be reached until from seven to nine days. And in some cases, when this climax is reached, the symptoms continue with but little abatement for almost as much longer, and then slowly decline, until at the end of from four to six weeks all the more important consequences of the inflammation have disappeared. I have not known any cases of mercurial salivation to terminate fatally. But when the inflammation has been very severe and protracted, the gums have been so far destroyed, and the teeth loosened from their sockets, that it became necessary for their removal; in some instances the inflammation has extended to the periosteum of one or both jaw-bones, ending in more or less necroses.

Such is the general course of the different degrees of salivation, or inflammation induced by the incautious use of mercurials. Forty years since, during the earlier years of my professional life, I saw many cases illustrating all the various grades of inflammation produced by mercurials. But the change which has taken place in the administration of this class of remedies has been such that I have met with very few instances, and these of the milder character, during the last twenty-five years.

Treatment.—In the treatment of mercurial inflammation of the mouth, of course the further use of mercurial preparations must be dispensed with; the patient placed at rest on the use of the most bland and simple nourishment, such as milk, thin wheat flour and milk gruel, oat meal gruel, beef tea or other animal broths, in sufficient quantities to sustain nutrition, and all attempts to use solid food or articles requiring mastication should be avoided. It is better that the bowels be kept in a regular condition, either by the mildest laxatives or enemas, while all drastic articles of physic are worse than useless.

For ameliorating the condition of the mouth, I have found nothing more valuable than a solution of the chlorate of potassium in mucilage of gum arabic, with tincture of belladonna added in such proportions that with each dessert spoonful of the solution the patient would get from three to five decigrams (gr. v-iii) of the chlorate and from one third to one fifth of a centimeter (min. iii-v) of the tincture, which quantity may be given profitably as often in the milder cases as once in six hours, and in those more severe every two or three hours, until the symptoms have materially improved. In those cases in which there is *acute glossitis*, or inflammation and much tumefaction of the tongue, I have thought the iodide of potassium given in the same manner and in the same doses as the chlorate exerted a more beneficial influence.

In the later stages of the disease, when patients have become considerably debilitated, and the ulcerations in the mouth seem disposed to heal slowly, an increased amount of nourishment should be given and the use of compound tincture of cinchona, or tincture of the chloride of iron, may be substituted for the chlorate of potassium or the iodide. For local remedies directly to the mouth, weak solutions of carbolic acid or permanganate of potassium are perhaps the best, particularly in all the earlier stages in the progress of the inflammation. When the flow of saliva is very profuse I have thought the addition of belladonna to the solutions

either of the permanganate or carbolic acid had some effect in lessening this flow, and consequently aided in relieving the patient. But it is with the same motive, namely, to aid in checking the flow of saliva by its influence upon the vaso-motor nerves that I add belladonna to the solutions of chlorate of potassium and iodide of potassium, as I have already recommended for internal use. When the disease has passed its climax and the ulcerations in the mouth are inclined to heal but slowly, or remain stationary, you sometimes derive much advantage from the use of local applications of a more stimulating or astringent quality. The infusion of coptis root and sage leaves, as already mentioned; infusions of the geranium maculatum root, or of calamus (sweet flag) root will be found among the best, as washes to be applied freely to the whole surface of the mouth and fauces three or four times a day. In some rare instances, individual ulcers assuming a more indolent form, may be benefited by touching them directly with the solid sulphate of copper in the same manner as mentioned in the treatment of apthous ulcers.

Stomatitis Materni.—The disease commencing in the mouth designated as *nursing sore mouth*, is peculiar to women during the period of nursing, and in some cases during the advanced stage of pregnancy. It appears to originate from a deficiency in the relative proportion of some of the constituents of the blood needed for maintaining healthy nutrition, caused by the separation of too large a proportion of those ingredients for the nutrition of the fœtus in the latter months of utero-gestation, and still more in the milk secreted during the period of nursing. Precisely which of the elements of the blood necessary for maintaining nutritive processes are deficient, has not been ascertained. Examination with the microscope, together with some chemical analyses made by myself several years since, led me to the conclusion that there was deficiency both in the chlorine and the phosphatic salts in the serum of the blood, and some degree of deficiency in the hæmatin, or the particular form of iron necessary for the formation of the red corpuscles. But, without attempting to define positively the particular change in the condition of the blood which precedes and accompanies this form of sore mouth, it is sufficient for our present purpose to recognize the well established clinical fact that the disease originates and progresses only during the period when there is a drain upon the nutritive elements of the mother's blood, of such materials as are required to nourish her infant, either in the advanced period of its growth before, or during the most rapid period of its development after, birth. The great majority of cases of this kind commence in from two to eight weeks after the confinement of the mother, and the commencement of her nursing. It is not very uncommon, however, for it to commence at a later period, and a smaller number not only begin but make considerable progress during the last two months of pregnancy.

Symptoms.—The initial symptoms of the disease are usually a feeling of heat and tenderness along the edges of the tongue, the inside of the cheeks, and a little later, the inside of the lips and the edges of the gums. On examining the mouth at a very early period, the parts affected will present only a slightly reddened and granular appearance as though the epithelial layer of the membrane had been disturbed. A few days later there will be very distinct red spots upon the edges of the tongue, sometimes upon the interior face of the fauces, inside of the cheeks, varying in size from the head of a pin to elevated patches the size of a silver half dime. Usually the inflammation thus begun in the membrane of the mouth extends pretty rapidly until in a few weeks' time it will occupy the greater part of the membrane lining the inside of the cheeks, the lips, edges of

the tongue, and along the gums and fauces. In many, the tonsils become slightly swollen as well as the sub-maxillary and sub-lingual glands, causing a considerably increased flow of saliva and a constant sense of heat or smarting greatly aggravated whenever the patient attempts to take either food or drink. In the meantime the general condition of the patient shows progressive impoverishment, by a paler countenance, some loss of flesh, decided feelings of weakness or weariness on slight exertion, a little quickening of the pulse, sometimes headache, and in the earlier stages moderate constipation of the bowels. In some instances the patients often complain of much dull aching pain and a sense of weariness, especially in the lower extremities during the latter part of the afternoon and evening, with slight elevation of the temperature above the natural standard. The more inflamed patches of the membrane lining the mouth gradually soften and disintegrate, presenting appearances of irregular superficial ulcerations. The saliva and breath become more or less offensive.

In many cases the disease extends slowly but steadily backward over the pharynx, adding difficulty and pain in deglutition, and sooner or later attacking the membrane lining the stomach. Its invasion of the gastric mucous membrane is marked by feelings of heat, or burning in the stomach, greatly aggravated whenever the patient takes food, and after making progress for one or two weeks, destroys the appetite and prompts the patient to frequently reject by vomiting even the blandest articles of nourishment. The patient, now being able to take and retain but a very small amount of nourishment, becomes much more rapidly impoverished than while the disease was confined to the mouth and fauces. If no measures are taken to counteract the progress of the disease, evidences of inflamed patches of the mucous membrane of the ilium are added to those of the stomach. Sensations of more or less heat or burning, and occasionally griping pains, are felt in the abdomen, with increased peristaltic motion, and now, instead of a tendency to constipation the bowels become loose, often giving rise to from four to six or eight thin reddish brown passages every twenty-four hours. The disease, having thus invaded a large portion of the mucous membrane of the mouth, stomach, duodenum, and lower half of the small intestine, deprives the patient of the ability to either receive or digest nourishment on the one hand, and to undergo sufficiently active wasting from the diarrhœa on the other, to cause so much emaciation and loss of strength as to compel her to take her bed. And if the nursing process is continued, the disease and exhaustion progress with steadily increasing rapidity until the destruction of a large portion of the mucous membrane of the alimentary canal has taken place, when the discharges become involuntary, the urinary secretion nearly suppressed, and the patient dies from asthenia, or exhaustion. Such is the clinical history of severe cases of this form of disease, when it is allowed to take its own course uncontrolled by appropriate treatment, or by the removal of its cause. But there are very many milder cases in which the inflammation is limited during the whole period of its progress to the membrane of the mouth and fauces causing the mother much inconvenience and suffering, and yet not destroying her ability to maintain sufficient nutrition to go through the ordinary period of nursing, at least nine or twelve months, and on the cessation of this process by weaning of the child, the mouth speedily heals and her usual health is restored.

There are many other cases of considerable severity, in which the mother, by the use of appropriate remedies and diet, and the addition of good hygienic surroundings, may so far control the progress of the disease

as to secure entire relief and continue her nursing. In many cases, however, the best treatment will only hold the disease so far in abeyance that the suffering amounts to no more than an uncomfortable tenderness and feeling of heat in the mouth, increased while taking food, but not interfering with the process of nutrition sufficient to prevent her from continuing the duties of her household throughout the whole period usually allotted to nursing. My attention was first strongly directed to this form of disease nearly forty years since. I then studied a few cases with much care, watching closely the influence of different remedial agents, and also chemically and microscopically examining the composition of the blood, until I became satisfied that the elements chiefly exhausted, or reduced to too small a proportion for the proper nutrition of the mother, were the phosphatic compounds, and perhaps in a less degree the chlorine salts. Becoming satisfied of the general correctness of this conclusion I have since treated all the cases that have come directly under my own care, mainly, with the view of increasing the amount of these agents in the blood, and the result has been entirely satisfactory.

Treatment.—At the period of time to which I allude, a case of the disease occurred in my own family. As it was very desirable to avoid taking the child from the mother's breast, I procured as eminent counsel as could be obtained then in the city of New York, and the patient was treated for four months with the best diet and what was deemed the most efficient tonics, including the various preparations of iron, quinine, the different preparations of cinchona and other bitter tonics, aided by the liberal use of milk-punch, egg-nog, and all the class of agents supposed to be capable of sustaining strength and promoting nutrition. But the disease steadily increased, apparently being in no sense controlled or modified by the treatment adopted, until at the end of the four months the mother had become so much reduced, that it was deemed no longer safe to allow nursing to proceed; and consequently the child was removed from her breasts. The further secretion of milk soon ceased and was followed directly by indications of improvement in the condition of the mouth and stomach, and in a few weeks without any other remedial influences the mother had recovered. It was the unsatisfactory result of the treatment in this case that led to the further study of the pathological condition of the blood to which I have already alluded. Acting upon the hints gained in that study, I commenced in all the subsequent cases that came under my observation in their early stage, while the mouth was simply tender and burning with only slight patches of redness in it, to give internally four cubic centimeters of the compound syrup of the hypophosphites, or the same quantity of the syrup of the lacto-phosphate of calcium, immediately after each meal.

The patients have been allowed to take no stimulants, no preparation of iron, but the simpler and more easily digestible articles of food, being careful that they had, as far as practicable, access each day to some outside air by riding, or at least sitting in the sunshine outside the door. When the use of these remedies was begun thus early they invariably checked the progress of the disease. And although I have seen many of these cases within the last thirty-five years, in no instance where the remedies have continued to be used steadily with proper attention to diet and good air, have the patients failed to so far keep the disease in check as to be able, with only a very moderate degree of inconvenience, to go through the ordinary period of nursing. The same mother whose case proved so obstinate that the child had to be weaned after the fourth month, in two subsequent pregnancies began to exhibit the incipient

stage of sore mouth about the end of the eighth month of each, and it slowly increased through the remaining month to the time of confinement. The commencement of the process of nursing was almost immediately attended by an increase of these manifestations of soreness in the mouth, bringing the disease to a degree of development that was unmistakable, when a resort to the use of the remedies I have just named soon arrested its further progress, and so long as they were faithfully used at each meal-time, the disease was held so far in abeyance as to leave at times no feelings of inconvenience in the mouth. But if, as happened several times during the progress of the period of nursing, the mother feeling but little inconvenience and weary with the daily taking of medicine, neglected it for one week, the symptoms of inflammation were again plainly manifested. The resumption of their use was followed again by the usual degree of relief. It appears to me that these cases, together with others that I had the most favorable opportunity to watch, furnish as perfect a demonstration of the efficacy of these remedial agents, in supplying the needed materials to the blood, and in consequence either entirely arresting or ameliorating the disease, as we could get by any process of experimentation on the use of remedies. But, it is only when the treatment has been commenced, in the early stages of the disease, more particularly before it has invaded the membrane lining the stomach, or produced very extensive ulceration in the fauces, that it is certain to arrest its progress. If the use of the remedies is delayed until the disease has made considerable advancement, and especially after it has invaded the membrane of the stomach, producing a tendency to reject food and sometimes the medicine itself, the patient will continue to lose flesh and strength and the disease will continue to extend until it occupies the whole of the mucous membrane.

There are other remedies, however, besides those I have named, that are regarded as producing some beneficial effect, and I am quite sure, when the patients are living in a highly malarious district, the use of quinine in moderate doses will aid materially in retarding or arresting the disease. Chlorate of potassium is also a remedy which has been used with a considerable degree of success. Some writers speak confidently of the efficacy of large doses of the chlorate of potassium, ten to fifteen decigrams (gr. xv to xxv) three times a day. I have not used this remedy in such large doses, but I have given many patients a solution of the chlorate of potassium in mucilage of gum arabic in doses of from two to three decigrams (gr. iii to v) three times a day with decided advantage. A weak solution of chlorate of potassium and belladonna may be used as a wash for the mouth and gargle for the throat three or four times a day also with benefit. Another excellent wash and gargle, especially after the disease has progressed to superficial ulceration, is the infusion of coptis or gold-thread root, sage leaves and a little borate of sodium, prepared as I have previously mentioned in the treatment of another form of sore mouth. The burning in the mouth will be much alleviated in most cases by allowing the patient to take frequently and plentifully of cold mucilaginous fluid, such as solutions of gum arabic, slippery elm or comfrey root.

They may be made more cold by placing in them lumps of ice. Whenever the disease has progressed so far, before coming under treatment, as to invade the mucous membrane of the stomach, or any part of the alimentary canal, making it difficult for the patient to retain food, or causing more or less wasting diarrhœa, it is not proper to subject the patient to the further risk of losing her health and, perhaps, ultimately her life, by

continuing the process of nursing. But the child should be taken from the breast and provided for in some other proper way, a good healthy wet nurse being altogether the best when it is practicable, and the mother relieved from further drain occasioned by the secretion of milk. If this is done, and at the same time the remedies I have recommended, together with a simple diet consisting largely of wheat flour and milk gruel, or oatmeal gruel, are perseveringly used, it rarely happens that improvement does not commence within a week and progress rapidly until the patient's recovery is complete. Only one exception to this remark has come under my notice during the whole period of my practice. It was that of a young mother who had the symptoms of the disease developed before the end of the first month after she commenced nursing. She obtained but little treatment of any kind during the next three or four months, until the disease had rendered the whole mouth and fauces excessively sore, and the mucous membrane of the stomach so far involved that very little food or drink would be retained long enough for absorption, but would occasion severe distress during the little period of time it was retained. Still neglecting to remove the child from the breast after another month, diarrhœa commenced, and the symptoms of inflammation and ulceration of the mucous membrane of the ilium and parts of the colon supervened, with very rapid exhaustion of flesh and strength. Although at this late period of time the nursing was stopped, yet the patient continued to have a wasting diarrhœa, and in the next six months reached the stage of fatal exhaustion. I saw her only in consultation, perhaps six weeks before her death.

Scorbutic Stomatitis.—Another affection of the mouth which will require a few words of comment is that form of inflammation which exists in connection with a scorbutic condition of the system. *Scurvy*, as you are aware, originates from a defect in the supply of food; such defect usually consisting in the absence of a proper proportion of vegetables containing the ordinary fresh vegetable juices and saline matters, until these elements become deficient in the whole mass of the blood. Among the evidences of general impairment of nutrition in such cases, we have early the appearance of a swollen, reddened and sensitive condition of the gums around the teeth, and to some extent also of the lining membrane of the inside of the cheeks, and over the anterior face of the fauces. The gums, particularly, are swollen, tender, and bleed on the slightest touch. And as the disease advances the inflammation follows the periosteal membrane into the sockets of the teeth, causing them to become loose, sometimes to the extent of falling out spontaneously, the gums become ulcerated, with patches of ulceration all along the inside of the cheeks, portions of the fauces about the junction of the jaws, and sometimes the inner surface of the lips. There is much general debility, dullness of the patient's sensibilities; in many cases petechial spots on the cutaneous surface, slight hemorrhages in the areolar tissues, and very frequent oozing of blood both from the gums and the nostrils.

If the disease is allowed to progress, the patient is apt to exhibit an œdematous condition of the feet, ankles and sometimes backs of the hands. Often the face about the eyes looks puffy and bloated, the urinary secretion becomes scanty, general dropsical infiltration of the tissues supervenes and not infrequently diarrhœa, hemorrhages from the bowels, sometimes vomiting of blood, ultimately complete exhaustion, collapse and death of the patient takes place. This is not the place, however, to discuss the general subject of scorbutic disease, but only so far as it tends to induce inflammation in the mouth. You will sometimes meet with these cases of scorbutic inflammation in the mouth where you would not suspect them.

It has been my fortune several times during my residence here in Chicago to meet with well marked cases of this disease in the poorer class of families living in bad sanitary surroundings, during the middle and latter part of winter when fresh vegetables were too expensive for their use, causing them to live almost entirely upon salted meat, bread and tea. In two or three different seasons when there has been special scarcity of fresh vegetables in the market, the children in one of the orphan asylums were almost all found to be affected with well-marked scorbutic inflammation of the mouth and gums; and some of them with characteristic petechial spots on the surface, swelling of the feet, ankles, wrists, backs of the hands and rheumatic pains to such an extent as to be rendered entirely helpless. I recollect, many years ago, one of the most active and eminent members of the State Medical Society (Illinois) called the attention of the society, at one of its meetings, to the fact that in the open prairie country in the central part of the State, he had found well-marked developments of scorbutic disease in the families of well-to-do farmers living without the use of fresh vegetables during almost the entire winter and early spring. For as he very correctly remarked, at that period of time many farmers in Illinois who possessed hundreds of acres of rich prairie lands, and sold thousands of dollars' worth of cattle and grain in the market would not take the trouble to raise an ordinary supply of garden vegetables for their own use.

The essential treatment for this variety of sore mouth consists in supplying the patient with bland nutritious food, embracing a sufficient amount of fresh vegetable ingredients. The use of good potatoes is often efficient when present in sufficient quantities in the market. Almost any of those vegetables that contain plenty of the vegetable acids may be used, if they are palatable to the patient. In one of the orphan asylums to which I alluded, in a season when not less than twenty or thirty had become severely affected before any medical aid had been called for, fresh, tender rhubarb stems or pie plant, stewed, with the addition of a little sugar, making a pleasant tart sauce, was given to all of them, very much to the gratification of their tastes, and certainly affording much aid in their recovery. In addition to the supply of proper nourishment, good air, and cleanliness, the three things most essential in the treatment, some good can be obtained by the use of antiseptic and slightly astringent washes; perhaps among the best is a solution of permanganate of potassium, of the strength of two or three decigrams (gr. iii or v) to sixty cubic centimeters (℥ii) of water, with which the mouth may be rinsed from three to four times a day.

Another excellent wash for local effect upon the mouth consists of carbolic acid and sulphate of zinc, each three decigrams (gr. v), pure glycerine, ten cubic centimeters (fl. ʒiiss) with a hundred and seventy-five cubic centimeters (fl. ℥vss) of water. Some advantage may also be obtained by the administration internally of the compound syrup of the hypophosphites acidulated with phosphoric acid sufficient to give it a slightly tart taste; and perhaps still better the syrup of the lacto-phosphate of calcium, and a small amount of the sulphate of quinine or some of the more palatable preparations of peruvian bark. If diarrhœa exists it should be controlled by the very cautious use of anodynes, of which, if the stomach will retain it, small doses of the compound powder of opium and ipecacuanha will be preferable. If this is not well borne by the stomach, small doses of carbolic acid in solution with camphorated tincture of opium may be given as a substitute, the dose of the two ingredients being duly proportioned to the age of the patient.

Gangrenous Sore Mouth.—Another inflammatory affection of the mouth sometimes though rarely met with, is what I shall denominate gangrenous inflammation. This appears in two forms. One, of which I have seen only a few cases, is limited almost entirely to the gums. It attacks the thin edge of the gums, causing that edge to the depth of a single line to turn an ash gray color, become shriveled, and in three or four days to separate from the living part, leaving the latter raw, and truncated in appearance. But in a case that came under my observation, in three or four days after the separation of the first slough, another layer appeared to suffer death in the same way, and go through the same process of withering, separating and leaving a still deeper degree of ulceration and truncation of the remaining gums. Another of these cases of disease seemed to attack, first, only the gums around two or three of the front teeth and extending directly from them backward, attacked the gums successively until all or nearly all of the gums in the mouth had undergone the same change. Cases of this variety have been known to extend from the gums to the alveolar process, until the teeth have been loosened and removed from their sockets, the jaw denuded of its flesh and the bone itself affected with caries. The disease extends finally to the cheeks, inducing a degree of phagedænic ulceration, which soon destroys all the soft parts, leaving an open door to the mouth through which the saliva is constantly drooling. This causes rapid wasting of the patient like one suffering from some malignant form of disease. Such instances generally end fatally. When disease thus assumes a phagedænic ulcerative character, and destroys the cheeks and soft parts of the mouth, it has been denominated by most writers, *cancrum oris.* But this latter disease by no means always commences with gangrene of the gums. It not infrequently has its beginning in small irritable ulcers upon the inside of the cheeks which extend rapidly in all directions until they produce the extent of destruction I have already alluded to. In most of the cases that have come under my observation the disease has been limited to the gums. Two of them recovered under constitutional treatment, combining tonics with mild alteratives, and the use of local astringents and slightly stimulating washes.

One of them, however, persisted until the safety of the teeth and gums was threatened. The patient being an inveterate user of tobacco, he was persuaded to discontinue its use. Within a week after the discontinuance of the tobacco the gums began to improve, and continued to do so until recovery was complete. After getting entirely well and remaining so for three or four months, the patient began again his old habit of using tobacco, gradually increasing it until he had returned nearly to his former excessive use, when to his surprise the disease again attacked his gums. On omitting his tobacco recovery soon took place; and after going without it for a year he resumed his old habit, which was again followed by a return of the disease in his gums and mouth.

I think all the patients I have seen with this form of gangrene have been users of tobacco; and yet it would be unfair to assume that it was the chief cause of this disease. That the use of this agent is the chief cause of many chronic affections of the mucous membrane of the mouth and fauces, and that it tends to perpetuate or prevent the cure of many more having their origin in some other cause, I have no doubt. The treatment of this form of gangrenous and ulcerative sore mouth consists in the use of tonics internally, and the discontinuance of all habits that may have an injurious influence upon the patient; mild and nutritious diet, and the local application, first, of slightly stimulating washes. If no fa-

vorable impression is made, one or two applications of a strong solution of the chloride of zinc, or of the concentrated carbolic acid will usually so far change the morbid action that the subsequent use of milder astringent washes will be sufficient to arrest the disease. Some of the cases, called *cancrum oris*, or eating ulceration, occurring chiefly in children, are more malignant, and persist in their destructive progress in opposition to all remedies. The other form of gangrenous inflammation of the mouth to which I alluded, occurs usually in connection with some one of the acute general diseases, either during the last part of their progress or in the early stage of convalescence. The only cases I have seen occurred in connection with typhoid fever and small-pox. The first symptom of the disease is usually the appearance of a pale, ash-gray colored spot on the inside of the lip, or of the cheek, accompanied by considerable tumefaction from exudation into the subjacent connective tissue.

Before opening the mouth you will observe the lip or the cheek, as the case may be, to be swollen exteriorly, the skin a little paler than natural, smooth or shining in appearance. Placing your finger upon the surface you find it more dense or harder than natural. Examining the interior surface, you will find a prominent spot of the size usually of a half dime, the central portion of which presents a pale ash-gray color with a dark areola around its margin. The patient complains very little of pain or any kind of unpleasant sensation, except the feelings of stiffness or inconvenience in the motions of the mouth.

The swelling as I have described usually appears suddenly. In from twenty-four to forty-eight hours after its commencement, this central pale spot on the interior of the swollen part will have turned brown and more corrugated, presenting distinctly the appearance of a gangrenous slough. Sometimes the gangrene extends only through the mucous membrane, or a little way into the subjacent areolar tissue. The separation takes place at the line of the areola of redness, and in four or five days the dead tissue becomes loose, and is removed, leaving an open ulcer with a non-granulating surface resting upon a rather hard base. In other cases it extends through the whole depth of the tissues to the exterior. In the more superficial cases due attention to the patient's general condition, with mild soothing applications to the ulcer, will cause granulations to spring up, and in a brief time cicatrization is completed without resulting deformity. When the separation of the slough leaves an opening directly through the cheek or a portion of the lip, leaving a gap through which saliva drools from the mouth, and renders it difficult for the patient to take his food, much care is required in the local management, both for the purpose of aiding the retention of the saliva and in so directing the progress of repair as to make the resulting deformity as little as possible.

One of the most marked cases that have come under my observation occurred in connection with a case of confluent small-pox many years since. The patient, a woman at the head of a family, was attacked with the initial symptoms of small-pox simultaneously with her confinement; the pustules of the small-pox began to show upon her face in twenty-four hours after her delivery; and its development proved severely confluent. She became much enfeebled, and just at the completion of the suppurative stage of the eruption, gangrene attacked the inner side of one cheek, resulting in destruction of the whole of the tissues and leaving an opening exteriorly at least six lines in diameter. The patient, however, survived, and during convalescence, by keeping the opening exteriorly so covered as to prevent the contents of the mouth from coming through, it gradually filled up by granulations on the edges and

by an occasional application of nitrate of silver, the process was continued until it ultimately closed the whole opening, leaving only a depressed and unseemly scar in the center of the cheek. Another case occurred in a boy who suffered a long time from angular curvature of the spine, and in addition a severe attack of typhoid fever. Just as convalescence had fairly begun from the fever, this form of gangrene attacked the inside of the lower lip about midway between the center of the lip and the angle of the mouth. It resulted in the death of the entire thickness of the lip, and separation as a gangrenous slough, from the median line of the incisor teeth to a little beyond the angle of the mouth and down to the junction of the lip with the jaw, taking out the entire left half of the lower lip.

Convalescence, however, was not interrupted and after the recovery was complete and as good a condition of general health restored as he was capable of having with his old angular curvature of the spine, there was left a large gap through which the saliva and the liquids taken into the mouth freely escaped. My colleague in the chair of clinical surgery, Dr. Edmund Andrews, at my request then performed an operation somewhat similar to that for hare-lip, which resulted in restoring the continuity of the parts, and remedying all the inconveniences the patient had suffered except a straight seam where the edges of the lip were united. The lower lip appeared shorter than the upper. I know of no treatment that is required for this form of gangrene in the mouth except that which is needed by the general condition of the patient, and the use of such antiseptic applications as will destroy the formation of septic material, and the offensiveness of the odor during the separation of the gangrenous parts from the living. And after such separation to so treat the gaps that may be left as to leave the least deformity on the completion of the patient's recovery.

LECTURE LI.

Inflammations of the Organs of Digestion, continued—Glossitis, Tonsilitis, etc.; their Symptoms, Diagnosis, Prognosis and Treatment.

GENTLEMEN: By glossitis is meant inflammation of the muscular structure and connective tissue of the tongue; and except in connection with mercurial salivation, of which I have already spoken, it is of rare occurrence. The action of some of the corrosive poisons when taken into the mouth, and attempted to be swallowed, extends to the substance of the tongue and causes severe glossitis. Occasionally a case of inflammation involving the tonsils, fauces and tongue will be met with in the same patient, occurring idiopathically or without any known cause. Within the last three days I have seen two cases of this kind in which inflammation of an acute grade attacked the tonsils and extended rapidly over the whole fauces and to the root and back part of the tongue. The inflammation steadily increased for about three or four days from the commencement of the attack, when,

in both instances, the tongue was sufficiently swollen to make it difficult for the patient to retain it inside the mouth ; causing the jaws to be kept open and the tongue to protrude between the teeth. At the same time three or four other children in the same family had different degrees of inflammation of the fauces and tonsils, when one of them presented a diffuse red exanthematous rash of moderate extent, much resembling the rash of scarlatina. But in neither those having glossitis, nor those having simple sore throat, did their symptoms correspond with scarlet fever, nor did they show any appearance of diphtheritic exudation upon the surface of the tonsils. The disease ran a brief course reaching its climax in about four or five days, then declined until convalescence was reached at the end of the seventh day. Such cases as involve the fauces are of frequent occurrence during the transition seasons—fall and spring, but extension of the inflammation to the tongue is quite uncommon. The symptoms of glossitis are pain, usually of a dull character, referred to the region of the larynx and roots of the tongue, much swelling or enlargement usually of the whole body of the tongue, though sometimes it is limited more to the back part, at others to one half of the tongue longitudinally. The degree of swelling varies much in different cases, from a moderate degree of enlargement, the tongue may swell so as to fill up the whole mouth, protrude beyond the teeth and render it almost impossible for the patients to perform the act of deglutition. After the first twenty-four hours there is usually an increased flow of saliva, either dribbling from the mouth when the tongue protrudes or accumulating in the fauces giving the patient more or less difficulty and pain in dislodging it.

The pulse is usually moderately accelerated in frequency and increased in force, with slight general increase of temperature. In most cases there is some degree of headache, especially in the frontal region, and a very unpleasant feeling of fullness and obstruction in the fauces. Sometimes the disease has been known to be protracted a week, and finally terminated in suppuration, forming circumscribed abcesses in the tongue itself. Far more frequently, however, the inflammation reaches its climax in from three to five days, and then gradually declines and disappears by resolution, without suppuration. I have noticed it much more frequently in young persons between the ages of five and fifteen years, than either at an earlier or later period of life.

When the disease is of a moderate degree of intensity, it is sufficient to keep the patients at rest, giving them bland, simple nourishment, opening the bowels moderately by a saline laxative, after which from two to three decigrams (gr. iii to v) of iodide of potassium in solution with the same number of minims of tincture of belladonna may be given every three or four hours until the inflammation abates and the tongue returns more nearly to its natural condition. When the saliva is very viscid and difficult to dislodge from the back part of the mouth, rinsing out the mouth freely with slightly acidulated gargles, such as a weak solution of chlorate of potassium, rendered very slightly acid by a few drops of hydrochloric acid, will often much relieve the patient. In cases more acute and severe in their character, leading to rapid swelling of the tongue, sufficient to threaten much obstruction to deglutition, and greater or less obstruction to breathing, an application of leeches directly along the side of the pharynx under the angle of the jaw, the number being adapted to the age of the patient, thereby producing free local bleeding, will be of much advantage. In the two recent cases to which I alluded the particular remedies used were a solution of the chlorate of potassium with tincture of belladonna in the proportion just named, given every four

hours, and three decigrams (gr. v) of the salicylate of sodium, in solution, between.

Tonsilitis.—Inflammation of the tonsils to which I next call your attention, is very much more frequent in its occurrence than any form of glossitis. It occurs chiefly during the cold seasons of the year, especially during cold, wet and changeable weather, and occurs much more frequently during the period of early adult life than later. Some patients acquire such a degree of susceptibility to inflammation of the tonsils, that they suffer an attack from one to three times almost every year; more frequently in the early spring months, but sometimes both in the latter part of the fall and the spring. Inflammation attacking these glands may be met with of almost every degree of intensity, from a purely chronic grade, to that of the most acute and severe. The symptoms which characterize the beginning of the acute and subacute attacks are usually a brief period of chilliness, with more or less aching in the back and limbs, sometimes in the head, followed by a moderate degree of general fever. It causes acceleration of pulse, ranging from ninety to ninety-five per minute, dryness and heat of the skin, slight degree of thirst and frequently a thin white coat upon the tongue. In most instances the urinary secretion is redder than natural and scanty. Among these early symptoms, coincident with moderate feelings of chilliness, is a sense of soreness and fullness in the fauces, causing sharp pain in deglutition, and often sending sharp pains in the direction of the middle ear. On looking into the fauces the tonsils are seen to be swollen, one or both of them, forming rounded projections on each side of the arch of the fauces between the folds of the palate, having an intensely red appearance, at first rather dryer than natural, but before the end of the first twenty-four hours, accompanied by an increased secretion of viscid saliva. In acute cases the swelling and redness increase with considerable rapidity for about three days; at the end of which time the patient finds it extremely difficult to perform the act of deglutition, the effort causing very acute pain both in the fauces and in the direction of the ears; the respiration is moderately obstructed more by the collection of viscid mucus than by the actual narrowing of the passage of the larynx; a great sense of fullness and obstruction. sometimes creating a feeling of suffocation is experienced. There is much frontal headache, marked acceleration of pulse, and in many cases a feeling that the patient can not take the recumbent position, but must lean forward to let the saliva "drool" from the mouth, or be turned to one side so that it will not gravitate back into the fauces. In the most acute class of cases, such as are met with only occasionally, with both tonsils involved at the same time, the swelling becomes so great that the glands touch each other in the center, crowding the uvula in front of them, and so narrowing the passage over the root of the tongue as to produce really much obstruction to respiration, preventing the patient from assuming the recumbent position altogether, so far interfering with the oxygenation and decarbonization of the blood as to give a leaden hue to the countenance, purplish appearance under the nails and lips, coldness of the extremities, small, thready, weak pulse, with disposition to drowsiness; and yet inability to continue sleep more than a few seconds on account of feelings of suffocation, making an assemblage of symptoms decidedly alarming, and if not speedily relieved they might result in the actual death of the patient.

But in nearly all the cases that have come under my own observation, the arrival of this stage, with the symptoms just named, has been accompanied by suppuration, or the maturing of an abscess in the tonsil, which if not opened by a free incision has broken spontaneously during some

severe effort of the patient to clear his throat, and on the discharge of the pus by either process, the relief to the more distressing symptoms has been so speedy and complete, that in less than an hour the patient has been resting in a horizontal position in a quiet comfortable sleep. The rapidity of improvement after acute tonsilitis has terminated in suppuration and discharge of pus is remarkable. I have seen many patients that thought they were in danger of suffocation, who by having the abscess opened freely, were up and dressed the next day, declaring that they were quite well. In the more acute form of tonsilitis there is a decided tendency to suppuration ; so much so that if the disease is not promptly met by means strongly calculated to check the inflammatory process in its incipiency, the majority of cases will proceed to suppuration in spite of any subsequent treatment. The cases of a subacute character will often proceed very slowly, accompanied by symptoms of a milder character, reaching their climax at the end of five or six days, and then very gradually declining by resolution or return to their normal condition. Where patients are attacked with subacute tonsilitis once or twice a year, there is usually a tendency to hypertrophy or permanent enlargement of the glands. In children especially who have been a few times attacked with mild subacute inflammation of the tonsils from ordinary colds, the exudation appears to be sufficiently plastic to become incorporated with the natural structure of the gland, and to remain, giving them a size two, three or four times as large as natural, projecting as rounded or convex bodies into the opening of the fauces, crowding sometimes against the opening of the Eustachian tube so as to interfere with the passage of air to the middle ear, sometimes causing buzzing and noises in the ear, at other times slight impairment of hearing. There is still a lower grade of inflammatory action which appears often in the tonsils of children more frequently between the ages of five and eight years, not active enough to cause acute soreness, pain or fever at any time, but causing a little soreness for a few days on taking what is called a cold by exposure to cold and damp air, and leading to a steady increased growth of the connective tissue constituting sclerosis or hardening of the substance of the gland until it acquires the size of a hickory nut, impairing the tone of voice and often causing sufficient obstruction, so that when the patient sleeps it renders the sleep noisy or stertorous. Frequently the patient starts out of his sleep as if from fright. This often causes both parents and friends to be unduly anxious, fearing that some serious obstruction in the respiratory passages exists. But during it all, the patient complains very little from this hypertrophy of the tonsils.

Chronic enlargement of the tonsils almost always increases during the cold season of the year, and sometimes occasions impairment of hearing in some degree, while during the warm season it recedes sufficiently to relieve all the prominent symptoms, yet does not entirely disappear. Tonsilitis of any grade of intensity very rarely proves fatal. No such case has come under my own observation during all the years of my experience. I have met with several which, at the climax or period of maturity of the suppurative process, presented such symptoms as I have described, and caused a just apprehension that suffocation would take place if relief was not obtained by some means, speedily. In all such instances I have proceeded at once to make a free incision into the most prominent part of each tonsil, and have not failed to procure a free discharge of matter, and a speedy relief to all the more urgent symptoms. The treatment of acute and subacute tonsilitis, when they come under the care of the physician in the incipient or early stage of the disease,

may have for its object either an entire arrest of the disease by rendering the inflammatory process abortive, or simply to so moderate it as to avoid extreme distress and danger to the patient, until it had run more nearly its natural course to spontaneous recovery. For the first object, if the attack has been ushered in by a decided chill, such rapid development of swelling, pain and feverishness as to indicate a very acute form of the disease, an immediate application of five or six leeches to the neck directly opposite the tonsils, on each side, if the patient is an adult; a proportionately smaller number in children, may be made, and the bleeding encouraged by cloths wet in warm water after the leeches fall off, and as soon as it has ceased, the neck opposite the tonsils should be kept constantly covered with cloths wet in infusion of aconite leaves in which is dissolved muriate of ammonium. Internally, as early as possible, from four to six decigrams (gr. vi to x) each of the compound powder of opium and ipecacuanha and the sulphate of quinia may be given, and the same to be repeated if the patient does not fall asleep, and show some moisture of the skin, in four hours. There are some cases even of a very acute form, in which prompt local bleeding by leeches, the enveloping of the neck in cloths wet in some anodyne infusion, externally, and one or two full doses of the quinine and compound powder of ipecacuanha will be followed by a few hours of sleep, during which the patient sweats freely, the pulse returns to the natural standard, and the soreness that had rapidly commenced in the fauces, with almost equal rapidity declines. After the patient has finished his sleep the exhibition of a saline laxative sufficient to move the bowels moderately during the day, and another anodyne and diaphoretic powder the following night, will complete the resolution or arrest of the inflammatory process, the patient recovering with little or no other treatment. Cases of a less degree of severity, when coming under the care of the physician directly after the initial symptoms have commenced, may be rendered abortive by the same treatment without the use of the leeches or local bleeding.

But if this first stage of acute or subacute cases has passed by, and forty-eight hours have elapsed before they come under the observation of the physician, according to my experience, it is useless to attempt to abort the disease. The aim should then be simply to lessen the more distressing symptoms of the patient, by opening the bowels moderately if they are costive, allowing the patient to either gargle his throat, or swallow a weak solution of chlorate of potassium in which is placed a small proportion of belladonna every two hours, so as to bring the remedy in contact with the throat frequently. If there be considerable headache, dry skin, moderately full pulse, taking from six to eight decigrams of the salicylate of sodium dissolved in water every four hours, will act as an anti-pyretic and very much relieve all the symptoms most troublesome to the patient. Externally, cloths may be applied over the region of the tonsils, wet in the same infusion I have already mentioned. In the milder cases under the influence of these remedies the inflammation of the tonsils will usually reach its climax in from three to five days, and begin to decline, and disappear altogether in from seven to ten days. In the more severe cases suppuration will take place and the symptoms will gradually increase in severity in all respects until the suppurative process has matured and the abscesses are either opened, or break spontaneously, which in most cases will be between the fifth and seventh days from the commencement of the attack. Occasionally the process may be protracted to a later period. After this, in most cases very little treatment is required, the patient rapidly recovering. If there should be much

debility, loss of appetite, and inclination to night sweats, the patient will be benefited by taking moderate doses of quinine and iron three times a day, until the period of convalescence is passed. You will occasionally meet with cases of subacute tonsilitis, in which after the first week the more acute symptoms disappear but the tonsils remain large, redder than natural and sufficiently tender to cause some pain in deglutition, interfering much with the patient's comfort in eating and drinking, and subjecting him to a disagreeable sense of fullness in the fauces, with more than the natural secretion of viscid mucus.

In such cases I have found three decigrams (gr. v) doses of the iodide of potassium given four times a day to cause a more rapid decline in the enlargement of the tonsils and an earlier recovery of the patient. In these cases also, if the patient has resided in a malarious district, and presents a more or less anæmic hue, with a sense of lassitude, from two to three decigrams (gr. iii to v) of quinine morning and evening in addition to the iodide of potassium, may be given with advantage. When the tonsils have become permanently hypertrophied or enlarged, sufficient either to disagreeably obstruct the fauces, or interfere with the Eustachian tube, and render the sleep of the patient disturbed and uncomfortable, the most reliable remedy is simple excision. For this purpose an instrument having a circular blade can be used with entire ease in taking off the gland to a level with the surrounding parts, which is all that is necessary. What is left of the gland after the most prominent part has been thus excised, shrinks after cicatrization of the surface and causes no further inconvenience. Patients from whom the tonsils have been thus excised very rarely remain susceptible to fresh attacks of inflammation in these parts. If there be objection from any cause to excision of the tonsils when permanently enlarged, they may be reduced to such a degree as to render them comparatively harmless by persevering applications, either of nitrate of silver, sulphate of copper, or iodide of zinc. These applications to be effectual should be made at least once every day, and of sufficient strength either to deaden or decidedly cauterize the surface to which they are applied. They are most easily applied in the form of strong solutions, with a camel's hair pencil, the application being restricted of course to the surface of the enlarged tonsil. Their effects, generally, are slow, and consequently require to be continued with much patience in order to obtain success. This fact of itself, constitutes an additional reason for resorting to excision, whenever the patient will consent to it and is free from complications of a scrofulous tendency or coincident scrofulous enlargement of the lymphatic glands. In the last named cases excision had best be omitted; first, because the portion of the tonsil remaining will often slowly increase until the tumor is reproduced in the fauces, and as troublesome as before; secondly, for the reason that all such patients require careful and persistent treatment, medicinal and hygienic, for the removal of the constitutional scrofulous affection, and the same treatment which is most efficient for this purpose will itself generally remove the hypertrophy of the tonsils.

Inflammation of the Œsophagus.—Simple idiopathic inflammation in any part of the œsophagus is of more rare occurrence than in any of the structures to which I have alluded. Nearly all the cases that come under the care of the practitioner arise from the action of direct irritants; such as food and drink taken too hot, or acrid substances swallowed without proper dilution, or the accidental swallowing of corrosive and irritant poisons. From any of these causes inflammation may take place in the œsophagus, varying in intensity from the slightest blush of redness,

heat and smarting produced by a slight scald or burn, to that of the most intense inflammatory action and even corrosion. The slighter grades of inflammation arising from swallowing too hot or slightly irritant substances usually disappear spontaneously in from three to four days, by having the patients simply abstain from the use of coarse food and live during that time upon some bland, unirritating substances, and perhaps swallow once in three or four hours a spoonful of simple mucilaginous drink, rendered cold by ice.

In the more severe inflammations produced by corrosive and irritant poisons usually no other means than those just named, keeping the patient at rest, keeping up nutrition with as little use of the œsophagus as possible, and having what does pass through it, of the most bland, unirritating character, will constitute the best mode of treatment that can be devised. Inflammations excited by these substances are very liable to be followed, especially when erosion and destruction of more or less of the lining membrane has taken place, by contraction after cicatrization, sufficient to leave more or less stricture of the œsophagus, permanently interfering with the process of deglutition, sometimes rendering it almost impracticable for the patient to take sufficient nourishment through the constricted tube to prevent starvation. Such cases, if remedied at all, must be remedied by surgical interference, chiefly through well directed efforts toward dilating the constricted portion of the tube. There is a form of stricture of the œsophagus occasionally met with dependent upon morbid sensitiveness of the nerves supplying the muscular coat of some portion of this organ. It is seldom idiopathic in its nature, but is a reflex form of disease located in some other part of the nervous system. The symptoms in such cases are not such as to suggest the idea of inflammation, there being no fever, seldom pain in the part, and at times the patient performs the act of deglutition without difficulty. But when he attempts to take food, the contact of the latter with the sensitive nerves of the fauces, or commencement of the œsophagus, causes an immediate spasmodic contraction of its circular fibres, thus making a temporary stricture sufficient to arrest the progress of the food downward, and hold it for a few seconds, when not infrequently it regurgitates backward into the mouth and is rejected, or the stricture yields and allows it to pass into the stomach.

These cases are distinguished from inflammation of the œsophagus by the absence of heat, pain and sense of soreness in the part, and by the absence of any general febrile disturbance. They are distinguished from permanent contraction of the œsophagus from causes that I have already mentioned, or from development of malignant growths upon the œsophagus, by the fact that often after the food and drink has been arrested for a few seconds it is allowed to pass, and in the intervals between taking it no sense of obstruction exists, and still more by the fact that upon exploration of the œsophagus with a probang, the instrument will often pass unobstructed through the whole length of the tube to the stomach, or if its presence induces, like the presence of food, a spasmodic contraction and arrest of its progress, simply allowing it to remain, with slight steady pressure the stricture will usually yield and allow free passage of the instrument into the stomach. One of the most singular spasmodic strictures of the œsophagus, coming under my own observation, was that of a tailor who in a quarrel with a fellow tailor received a blow upon the occipital region of his head with a press-board. The blow merely stunned him for a moment, from which he recovered sufficiently to return to his home without difficulty. It was followed by no symptoms of cerebral disturbance or febrile reaction, but, immediate-

ly there was total inability of the patient to pass anything into his stomach. Everything given him would pass a little way down the œsophagus, be held for a few seconds, and regurgitated. The patient remained in this condition from seven to nine days without swallowing the smallest quantity of either food or drink. Being called to the case and learning its history, I caused the patient to make an effort to swallow, but without success. Considering the length of time he had been without nourishment, I immediately attempted to pass the stomach-tube of an ordinary stomach pump through the œsophagus, for the purpose of introducing nourishment through it into the stomach. When the end of the stomach-tube had reached about one third of the length of the œsophagus downward, its progress was arrested. But on making steady, moderate pressure, for perhaps ten seconds, the obstruction seemed to give way rather suddenly, and the tube passed on to the stomach without further difficulty. Through it, was passed a little more than a pint of fresh milk, and the tube withdrawn. In a few hours the patient found that he could swallow liquids without difficulty, and from that time he took food and drink freely.

Acute and Chronic Gastritis.—The word gastritis is usually applied to inflammation of the mucous membrane of the stomach. The inflammation of this membrane in some of its forms or degrees of activity is met with frequently, in the ordinary duties of the practitioner. The particular grades or varieties of the inflammation met with, are, first, diffuse general inflammation of the mucous membrane, which may be either acute or chronic; second, follicular inflammation which is generally of very limited extent and chronic in its grade; and, third, ulcerative inflammation or more properly chronic gastric ulcer. The first variety or diffuse inflammation of the mucous m mbrane is rarely met with in the acute form, except as the result of the direct application of irritating substances, as in swallowing acrid poisons, substances of too high a temperature, or from mechan ical injuries. But occasionally, cases of genuine acute gastritis occur from such ordinary causes as produce other acute inflammations.

Symptoms.—Acute gastritis, when it does occur, either as an idiopathic affection, or as the result of irritating ingesta, commences with a burning pain in the epigastrium usually becoming early very intense, like burning coals of fire in the stomach, dryness of the mouth, intense craving for cold drinks, a decided sense of oppression in the epigastrium, pain, not infrequently extending through to the central part of the spine, constant feeling of nausea, with frequent efforts at vomiting, and the prompt rejection of food and almost everything that is taken, even of the blandest character. Each act of vomiting is accompanied by increased epigastric distress and tenderness. The matters ejected, aside from what has been swallowed, consist of a thin mucous or serous fluid, usually tinged with the coloring matter of bile, sufficient to give it a green or yellow hue. The pulse in the first stage is usually quick and small, corded and tense, sometimes called wiry; the skin over the trunk of the body is hotter than natural, and dry, and the extremities often cold. The bowels usually are inactive, not obstinately constipated but simply indisposed to move at the ordinary intervals of time, and the quantity of urine is usually very scanty and high colored. In the most acute form of the disease the patient becomes rapidly prostrated, the pulse after the first twelve hours becoming thready, small, weak, the extremities more cold, often purplish or bluish, face pinched, eyes sunken, lips thin, mouth very dry, parched, edges and tip of the tongue redder than natural, the mind frequently wandering or incoherent, the abdomen bloated and

tympanitic, epigastric region exceedingly tender to the touch, so much so that the patient shrinks at the approach of the hand, and in most instances will not bear even the weight of a sheet upon the body.

From this time the matters vomited become larger in quantity; instead of a greenish fluid as at first, the color becomes dark brown, mixed with flakes; and the efforts at vomiting are still frequent, exceedingly distressing, and are promptly induced by anything that is taken into the stomach. If relief is not afforded, in some instances the failure of strength and vitality in the patient is so rapid, that after from twenty-four to thirty-six hours from the commencement of the attack, the urine is entirely suppressed, involuntary discharges take place from the bowels, the vomiting becomes more of a regurgitation, throwing out large quantities of dark grumous fluid, almost as black as the matter of black vomit in yellow fever. In a little time the pulse can no longer be felt at the wrist, the heart beats rapidly, with paroxysms of tumultuous palpitation, the mind becomes dull and drowsy, the abdomen extremely tympanitic and distended, and before the end of another day, entire collapse and death ensues. Cases of acute gastritis have been known to terminate fatally within twenty-four hours; but more generally the disease, even in the more acute form, continues from three to five days. And in a less acute form the symptoms that I have described may be protracted over a period of from one to two weeks, and yet terminate fatally. In some instances the commencement of an attack of gastritis is marked by chilliness of brief duration; but in nearly all the cases that have come under my own observation, no period of chill has been noticed. The symptoms supervene, as I have already described, from the beginning as the result of extreme gastric sensitiveness, the chief complaint at the first being a burning, broiling pain, and a most incessant disposition to vomit. Cases are met with that merit more the name of subacute than acute gastritis. These cases commence with the same symptoms, in a less degree of intensity, accompanied by less rapid pulse, less activity in all the morbid phenomena, and are protracted usually five or six days until the patient becomes much exhausted, and the pulse feeble, when the paroxysms of vomiting begin to be farther apart, the burning sensation in the stomach less intense, and small portions of cold, mucilaginous, bland liquids will be retained at least for a little time. The urinary secretion, diminished in the earlier stages, increases again as the disease passes its climax, the thirst becomes less urgent, but at the end of the second week, or from nine to fourteen days, the inflammatory action will have so far subsided, that the patient begins to show indications of convalescence. The stomach is still irritable, whenever the patient ventures to take more than very small quantities of bland material at a time; but small quantities are retained without much distress, and from day to day more is tolerated until the symptoms of undue excitability disappear.

The most acute form of gastritis is always a dangerous disease, and terminates fatally in the large proportion of cases. The milder attacks, properly denominated subacute, under any reasonably judicious management, will generally terminate in recovery. Two forms of chronic inflammation of a diffuse character are met with in practice. The first is generally the sequel of a previous acute or subacute attack. The primary subacute disease continuing its course for two or three weeks, only partially subsides, leaving the patient with a feeling of tenderness on pressure in the epigastrium, a sense of heat and dryness in the mouth and in the stomach, a desire for cold drinks, usually an aversion to taking food, or loss of appetite, an inactive condition of the bowels, slightly dimin-

ished secretion of urine, with skin dry, lips unnaturally dry and parched, edges and tip of the tongue redder than natural, pulse usually moderately accelerated, varying from ninety to one hundred, especially in the afternoon and evening. The mind is usually depressed, gloomy and despondent. The feeling of distress and burning in the epigastrium is greatly increased whenever food of any kind is taken into the stomach ; and unless it is taken in small quantities and of a very easily digestible character, it is usually followed by the generation of acids, and often in from half an hour to an hour or more the food is rejected by vomiting in a sour and only partially digested state. In this condition the patient usually retains enough of nourishment to prevent rapid emaciation and loss of strength, and may consequently continue to suffer from the disease an indefinite period of time. In a few instances that have come under my care, the patients have been afflicted with a chronic form of inflammation of the mucous membrane through periods varying from one to three years. In these old cases, the patients have uniformly been much emaciated, skin exceedingly dry and husky, lips thin, pale and more or less retracted, the countenance anxious and depressed in its expression, the pulse small but firm under the finger, respirations about normal, the urinary secretion pretty uniformly scanty and high colored, the tongue in these cases has presented a glossy reddened appearance over nearly its whole surface, with frequent, small, apthous, irritable ulcers along its margin, and sometimes in other portions of the mouth. The abdomen has usually presented a concave or empty condition, the bowels seldom moving oftener than once in three or four days, unless disturbed by artificial means, while everything in the form of ingesta taken into the stomach is followed either by prompt rejection by vomiting, or being retained it soon creates that distress and feeling of heat and burning that lasts usually from two to three hours, sometimes ending in vomiting of a sour acrid liquid, the food itself having disappeared; and when no vomiting occurs it gradually subsides by the apparent discharge of what had been taken through the pyloric orifice into the parts below, leaving the stomach empty. The other form of chronic gastritis to which I alluded is perhaps more properly designated as a hyperæsthesia or morbid sensitiveness of the mucous membrane than a true chronic inflammation. Its symptoms are undue sense of heat and tenderness in the epigastric region, increased by taking any kind of nourishment, a tendency either frequently, in a few minutes, to reject what has been taken, or when retained a gradual increase of the burning, and sense of distension, more or less nausea, and generally the generation of sufficient acid material to cause either the whole to be rejected in from half an hour to an hour, or eructations of acid to come up the œsophagus to the pharynx, causing an acrid sour taste in the mouth until the contents of the stomach pass through the pyloric orifice, when the active symptoms gradually subside, till further ingesta are taken. In most of these cases, however, the patients reject the larger part of what they eat within a few minutes after it is taken, and before it has had time to undergo any appreciable change. In these cases when the stomach is allowed to be entirely empty there is a vague sense of uneasiness accompanied by a gnawing or desire for food, but no sooner is the food taken than, as I have already remarked ; it is either promptly rejected, or it aggravates the suffering of the patient until it pass s through the pylorus.

Follicular Inflammation.—The prominent symptoms occasioned by inflammation of a chronic character, limited to the follicles of the mucous

membrane, are usually of a milder character than those I have described for the preceding forms of disease. In most of the cases of this class, the patients exhibit no marked febrile symptoms, neither the pulse, respiration nor temperature varying much from the natural standard. The secretions generally are but little interfered with, although the bowels are usually constipated or decline to move without prompting. The patients do not, usually, complain of epigastric tenderness, or if so it is slight. In most instances they take food with comparative relish, and for one or two hours after eating, they experience no other inconvenience than a slight feeling of heaviness. Indeed, most of this class of patients say promptly, that they feel better for the next hour or two after they take food, than they do at any other time. But, in from an hour and a half to two hours after they eat, they begin to experience a feeling of moderate heat, undue fullness, and oppression in the epigastrium, which increases steadily until the next meal. Others have a turn of vomiting by which they will reject from one to five ounces of a thin serous fluid, sometimes a little sour or acrid, but more generally tasteless; after which they are relieved. In other instances they do not vomit, but continue to feel more and more uneasy in the epigastric region until the next meal, when on taking food all uneasiness quickly vanishes, and as before, from one to two hours of comparative comfort ensues, when the same tendency to distress, heaviness, burning and gnawing sensations return and increase steadily until either vomiting, or the time for the next supply of food occurs.

In the milder cases of this class, the patient on rising from bed in the morning, and sometimes even before they get out of bed on first awaking, will feel a very decided sense of oppression and fullness in the epigastrium, with a constant nausea and disposition to vomit, which ends in the ejection by vomiting of a few ounces of the same thin serous fluid, to which I have before alluded; most generally tasteless and odorless, but in some instances slightly acrid, and in others a little acid. After rejecting this, they take their breakfast with comparative relish, experience no inconvenience until near the time of the next meal, when they feel oppressed, the stomach has a disagreeable sensation that they call gnawing or hunger, which ends only with their taking food. In some instances the feeling of distress and hunger will return in the middle of the night to such an extent, that the patient can appease it in no other way than by taking a small quantity of food, and then it quickly disappears. When the disease is more active, and a larger proportion of the follicles or gastric tubules are involved in the inflammatory action, the food is usually dissolved and passed out of the stomach by absorption, or into the duodenum in a remarkably short time. The secretion and accumulation of fluid after the food is digested and has passed out of the stomach, is so rapid that vomiting of a watery substance occurs pretty regularly, an hour or two before the time for the next meal; but it is never mixed with any of the food that has been taken. This has been previously dissolved, and rapidly passed out of the stomach, and what is vomited is only the secretion from the follicles or gastric tubules of the mucous membrane itself. A large proportion of these cases are of the milder class; and the vomiting only occurs in the morning. They are popularly styled cases of pyrosis or water-brash. They are far more frequently met with in persons addicted to the use of alcoholic drinks than in any other class, although not restricted exclusively to them. Occasionally the phenomena I have described occur during pregnancy, but not often.

If you study the phenomena of this form of gastric disease carefully, you will readily perceive that they indicate just that grade of irritation or in-

flammatory action, which causes an increased secretion of serous fluid, composed usually of a mixture of the serous exudation from the irritated follicles, and of the true gastric juice, showing that the irritation involves both the follicular structures and the gastric tubules. In the natural or healthy condition of these structures, especially of the gastric tubules, the secretion of gastric juice only takes place, actively, during the reception and the presence of food in the stomach, and ceases as soon as the stomach becomes empty. But in these cases the morbid condition of the structures causes the secretion to be continuous, and consequently it tends rapidly to accumulate in the stomach, when there is no food present with which it can be mixed and united as in the process of digestion. The patient takes food, and while the food is in the stomach, it mixes and more or less chemically unites with the ingredients of the secretion, and consequently relieves the patients from his morbid sensations. The food is thus rapidly converted into chyme, and passed out of the stomach. But the secretion goes on the same, and hence very soon begins to be a cause of increased irritation and distress, and sometimes vomiting.

LECTURE LII.

Gastritis, Acute and Chronic, Continued—Gastric Ulcer—Anatomical Changes in all Grades of Gastritis—Diagnosis, Prognosis and Treatment—Duodenitis, etc.

GENTLEMEN: The only remaining form of inflammatory disease in the stomach requiring notice is called the gastric ulcer. The symptoms in the early stage can hardly be distinguished reliably from those belonging to cases of ordinary indigestion or slight irritation of the mucous membrane. There is no continuous pain, tenderness in the epigastrium or febrile phenomena; but for several months after the commencement of the disease, the patient will occasionally, after taking more food than usual, be troubled with some feeling of soreness, acid eructations, some burning in the stomach for an hour or two, but by being more cautious in taking food he experiences so little inconvenience that no importance is attached to the case. After the continuance of these vague symptoms an indefinite period of time, perhaps suddenly, without any previous warning, the patient feels a sense of distension and warmth in the stomach, soon developing into nausea, and then copious vomiting, by which he ejects a large quantity of dark and partially coagulated blood. The quantity of blood varies much in different cases. In some it will be small, not more than an ounce or two, but in the majority of cases the quantity will amount to from eight to thirty ounces, filling an ordinary wash-bowl half full. It is always dark-colored, free from any intermixture of air bubbles, and very generally partially coagulated. These features distinguish it, at once, from blood coming from the lungs, which is always brighter colored and more or less mixed with air. The first attack of hæmatemesis or vomiting of blood will generally be of very short duration, but it leaves the patient paler, the pulse slightly quickened, the stomach more sensitive to the contact of food or drink, and with some slight epigastric tenderness.

By rest and abstinence from all but bland, simple nourishment, these symptoms subside in a few days, and the patient appears the same as before the hæmorrhage, except that his color usually remains of a more anæmic hue. The patient seldom recovers the fresh natural color of the lip, that he had before. Most generally, after the first turn of vomiting blood, during the two or three hours following each meal the patient continues to experience a little more distinct feeling of heaviness, or discomfort. Many days this will only be slight, at other times it will be more marked, and usually, after a few months, the symptoms of indigestion become more constant, accompanied by eructations of gas, and sometimes acrid or sour liquids. There will remain also a vague sense of tenderness in the epigastrium, more readily increased by pressure than in the earlier stage. These symptoms, however, are only those that often characterize common cases of functional disturbance of the stomach; but, usually in a period varying from one to six months another hemorrhage will occur of the same character as the first. The patient spontaneously vomiting pretty copious quantities of dark, partially coagulated blood, the first ejected being mixed in most cases with the contents of the stomach. This leaves the patient still more anæmic than after the first, but usually does not prevent him from again recovering so far as to resume more or less his ordinary duties of life, and to retain most of his food and drink. Thus he may pass one, two or three years, the hemorrhages occurring at long intervals at first, but increasing in frequency with each return, until the red corpuscles of the blood become very deficient, and the strength much impaired, when without loss of flesh or weight, he is seized with an acute or intensely sharp pain, in the region of the stomach. More frequently, the pain is felt in the left hypochondrium as if proceeding from the larger curvature of the stomach; but the location may vary in different cases, from near the epigastrium, to the extreme left curve of the stomach. This acute sudden pain is followed immediately by a sense of weakness, exhaustion, pallor of the countenance, small, thready pulse, cold extremities, and in a little while by vomiting. He throws off whatever is on the stomach at the time, and promptly rejects whatever drinks are taken, the abdomen becomes rapidly tumefied, tympanitic, the urinary secretion lessened or suppressed, the matter rejected by vomiting more copious, watery, first tinged with green from the coloring matter of the bile, subsequently by the action of the acids in the stomach, changed to a dark brown, or black, and gulped up more by regurgitation than by acts of vomiting. There is extreme distension of the abdomen, a purplish or leaden hue of the extremities, entire collapse and death. The latter takes place in from twelve to twenty-four hours from the time of the attack of acute severe pain. Such is the general history and termination of what is denominated chronic gastric ulcer.

The explanation of these phenomena consists in the fact, that, from the beginning the ulcer had been established in some portion of the mucous membrane of the larger curvature of the stomach, which gradually increased in size with thickened elevated edges, at the same time progressing deeper into the structure of the stomach and at various times during its progress eroding some blood vessels of sufficient size to occasion the hemorrhages that I have described. Ultimately it perforates all the coats of the stomach, opening into the peritoneum, giving rise to the last sudden severe pain, and allowing some of the contents of the stomach to escape into the peritoneal cavity, inducing rapid general peritonitis, collapse and death. In some of these cases the amount of blood vomited is

very large. In one case, coming under my own observation, I think without exaggeration of statement, the patient vomited in the course of twenty-four hours between one and two litres (three and four pints) of blood. And, yet, these hemorrhages very seldom prove fatal by direct exhaustion of the patient. Far the larger proportion of cases end in perforation and peritonitis, instead of dying from the quantity of blood lost.

Anatomical Changes and Post-mortem Appearances.—The anatomical changes produced by the different varieties of inflammation I have described, vary with the intensity, extent, and duration of the inflammatory process. In fatal cases of acute gastritis the mucous membrane appears intensely injected, somewhat tumefied, and varying in color from an intense bright red to a dark brown; the latter giving rise to the idea sometimes, of a gangrenous condition. There is almost always more or less softening of the membrane, and frequently the redness and increased vascularity presents a stellated appearance, as though radiating in lines from a common center. Examined more closely with the microscope the same changes are found here as in almost all other acutely inflamed structures, namely, exudation of the liquor sanguinis and white corpuscles into the texture of the membrane, proliferation or increase of the epithelial cells belonging to the surface, and some hypertrophy of the connective tissue—all of which tend to make the membrane appear thicker and more tumefied than natural, and of various shades of increased redness. In places there is detachment of much of the epithelial layer, and a loosening or softening of the texture. In some instances this softening amounts almost to actual disorganization of the texture. It is this loss of tone, or partial disorganization of the membrane in the last stages of the acute form of the disease that allows copious exudation, carrying with it more or less of the red corpuscles of the blood, changed to a blackish hue by the acids of the stomach, which constitutes the dark grumous material that is thrown up in such quantities about the time the patient is passing into final collapse. The same fluid is not infrequently found in considerable quantity in the stomach after death.

In many of the subacute cases of the disease, especially those which run a more protracted course, and finally terminate fatally, some portions of the mucous membrane will be found intensely red and tumefied, with all the changes that I have previously mentioned, except, that instead of softening, the exudative material will have sufficient plasticity to give it increased hardness or density; while other portions being less involved in the inflammation, are simply reddened or more vascular, with but little change either in the direction of induration or softening. In the purely chronic grade of inflammation, there is generally a very unequal degree of change in different parts of the membrane. Some portions will be thickened, hardened, more red and vascular than natural, and the surfaces will be studded with abrasions or superficial ulcerations, caused by the disappearance, in patches, of the epithelial layer of the membrane. Other portions will be simply increased in vascularity, slightly thickened, tumefied and indurated, without any appearance of the abrasions upon the surface, and the redness will be of a brighter hue. The cases which I have described as follicular, will present, usually, patches here and there, unequally distributed over the surface of the mucous membrane, of simply hypertrophied or enlarged follicles and tubules, giving to such places a slightly reddened and elevated appearance, sometimes granular or mammillated, and when they are examined more closely, especially under the microscope, they will be found to consist of hypertrophied

tubules and follicles, possessing all the characteristic changes of a low grade of inflammatory action. After death from chronic gastric ulcer, examination of the stomach usually discloses one, and occasionally two or three distinct isolated ulcers ; more generally but one, and this may vary in size from five to twenty-five lines in diameter. The edges are very generally elevated and a little rounded, though sometimes excavated and irregular. The greater part of the base of the ulcer is usually the naked fibers of the muscular coat of the stomach. In places these fibers may have disappeared, causing the base of the ulcer to rest upon the connective tissue between the muscular fibers and peritoneal covering externally. If the patient has died from perforation, in one of these deeper indentations will be found a small opening directly through into the peritoneal cavity, through which matters have escaped, inducing the final rapid and fatal peritonitis. Usually both the edges and base of the ulcer are harder or more dense than the natural texture, with a moderate degree of redness and increased vascularity surrounding them. But in many instances the remainder of the mucous membrane will vary but little from its normal, healthy appearance. Such are the changes of structure and the appearances, that are usually presented on post-mortem examination, from the various degrees and stages of inflammation in the mucous membrane of the stomach.

Diagnosis.—In the great majority of instances there is little difficulty in making a correct diagnosis of these different grades of gastritis. In the acute and subacute forms of the inflammation, the intensity of the burning or sense of heat in the stomach, the acute tenderness on pressure, the prompt and persistent vomiting, aggravated by every attempt to take nourishment, accompanied by a distinct general febrile condition, sufficiently distinguish these cases from any form of functional disease. There is more difficulty in keeping the line of diagnosis clear between the lower grades of chronic gastritis and some of the more active functional disturbances of the stomach. If you remember, however, that true chronic gastritis, is uniformly aggravated by taking food, and that the chief symptoms of which the patient will complain in the exacerbations, are burning, broiling in the epigastrium, dryness in the mouth, a pretty uniform reddening of the edges and tip of the tongue, and disposition sooner or later to eject whatever is taken, by vomiting, with more or less sourness, the almost invariable absence of gaseous eructations, with loss of flesh, slight quickening of the pulse, an increase of one or two degrees of temperature, you will have but little difficulty in making an accurate diagnosis. It is the association of burning and tenderness, persistent from week to week, with actual dryness of skin, slight acceleration of pulse, and elevation of temperature, that especially distinguish the chronic form of gastritis from any of the forms of functional disease. The follicular form of the disease has these special diagnostic features: that the morbid sensations are relieved for a time by taking food, aggravated as soon as food disappears, and there is a characteristic vomit that is called "water-brash" or pyrosis, as I have already stated, when speaking of the symptoms.

Gastric ulcer can seldom be distinguished from functional disturbance with certainty, in the early stage of its progress. But the first hemorrhage that occurs, if it be properly interpreted, will at once satisfy the practitioner that he has a positive lesion in the coats of the stomach to contend with, and thus the preceding obscure history becomes an element to add to the certainty of the diagnosis, and to fix it as a true chronic form of ulceration.

Prognosis.—The more severe attacks of acute gastritis always involve some danger to the life of a patient. Experience has shown that the larger proportion of them terminate fatally. The milder cases of the acute and most of the subacute attacks, under judicious management, tend to recovery. In the earlier stage of chronic gastritis the chances of recovery are usually good. But when the disease has been of long standing, causing much thickening and induration of portions of the mucous membrane and subjacent connective tissue, with permanent contraction of the muscular coat, in such a way as to lessen the capacity of the stomach, it is rare that recovery takes place; although the symptoms of the patient may be much mitigated by judicious treatment, and life may be prolonged through a considerable period of time. Most of the cases of recent follicular inflammation of the mucous membrane of the stomach tend to recovery under judicious management; but some are very persistent, and occasionally end, either in such changes in the follicles, or atrophy of the gastric tubules, as to present an incurable condition. Such cases interfere with the proper assimilation of food, and lead to a slow, but persistent loss of flesh and strength, and usually require several years to reach a fatal result. The chronic gastric ulcer, if diagnosticated early, and if the patient is placed under the most favorable circumstances in regard to diet and remedial agents, is susceptible of recovery; but when it has been of considerable duration, has attained considerable size, with elevated and somewhat hardened edges, it is most liable to resist all efforts to induce reparation, and to lead ultimately to a fatal termination.

Treatment.—The special objects to be accomplished in the treatment of acute and subacute cases of inflammation of the mucous membrane of the stomach, are the same as are presented to us in the management of all acute inflammations. But we are here met with a peculiar difficulty, from the fact that the very structure on which we ordinarily rely for introducing remedies into the system, is now the seat of the inflammation, causing a disposition to reject all remedies almost as soon as they are permitted to touch the membrane. When called to a case of acute gastritis within a few hours after its commencement, the patient not having been previously debilitated by any special disease or constitutional impairment, I have usually directed the application of from eight to twelve leeches to the epigastrium, in adults, promoting the bleeding from the bites by warm wet cloths, after the leeches have fallen off, and subsequently allowing the part to be covered with warm narcotic fomentations. Free local bleeding by leeches in the very early stage of the disease, has seemed to me to exert a very beneficial influence in checking its progress, and making the action of other agents more certain.

At the same time of ordering the leeches, I direct, if possible, the procurement of ice, to be cut in suitable pieces, and the patient allowed to take a small piece, holding it in the mouth until the angles are a little rounded and swallowing it at frequent intervals, in place of taking any other drink. As there is intense burning heat in the stomach, and craving for cold drinks, the use of the ice is very grateful to the patient, and serves the purpose both of acting as a sedative in diminishing the vascularity of the mucous membrane, with which it comes in contact when swallowed, and of satisfying the patient without the use of drinks, which would only increase the distress and efforts to vomit. To help allay the extreme morbid sensitiveness of the mucous membrane, and lessen the accumulation of blood in the vessels, I also direct at the beginning, a powder composed of the mild chloride of mercury, six centigrams (gr. i)

the sulphate of morphia one centigram (gr. 1-6), with three decigrams (gr. v) of saccharum alba, to be given mixed with just enough syrup, or a few drops of water, to moisten it, every one or two hours, allowing a bit of ice to be taken immediately after, in place of any drink. Although the vomiting will cause the rejection of a portion of these small doses of calomel and morphine, still experience shows that some portion of each dose attaches itself to the coats of the stomach, and is retained. By their frequent repetition in from six to eight hours, the patient will usually begin to exhibit the anodyne effects of morphine, in getting more rest, longer intervals between the paroxysms of vomiting, and at the end of twenty-four hours in many of the cases, the patient will be catching periods of from half an hour to an hour of sleep, and vomiting much less frequently. If during the first twenty-four hours of the treatment, there has been no evacuation of the bowels, I cause the administration of an enema of warm water, containing a little common salt, or sulphate of magnesia, the quantity of water being sufficient to fill up the rectum, which will usually be followed by a moderately free movement of the bowels. Instead of continuing the powders of calomel and morphine I now give a solution of carbolic acid, tincture of gelseminum, and camphorated tincture of opium, in the proportions I have already stated in previous lectures. (See p. 138.) After the patient has had the alterant and anodyne powders, which I have mentioned, for twenty-four hours, and the bowels have been moved by enemas, with a continuation of the fomentations of a narcotic character over the epigastrium and abdomen following the leeching, the powders should be discontinued and the carbolic acid solution given every two or three hours. This treatment has usually been followed by a pretty rapid subsidence of all the inflammatory symptoms, after which the intervals between the doses of the mixture should be lengthened to three or four hours, still being exceedingly cautious of the amount of fluid and nourishment that the patient takes. In nearly all the milder cases of acute gastritis and in all of those of a subacute character so often met with in children, this plan of treatment has been almost uniformly successful.

The patients are kept entirely quiet in the recumbent position. No attempt at the administration of nourishment is usually made for the first thirty-six or forty-eight hours; but after that, simply one or two tablespoonfuls of lime-water and milk, one part of the first and two of the second are given at short intervals. Sometimes the animal broths, such as beef tea, chicken broth, and mutton broth, may be given in similar small doses, either alternately with the milk and lime-water, or as a substitute for them. But the great leading object of the whole treatment should be to lessen the extreme excitability of the inflamed membrane by cooling, anodyne and slightly alterant influences, keeping all food from contact with it during the first one or two days, and allowing the use of only very small quantities of drink at any one time. In some instances, where the vomiting and epigastric distress are found to be extremely severe, and after one or two days it becomes evident that the little powders of calomel and morphine are not retained in sufficient quantity to allay the morbid excitability, their effects may be aided by the use of a hypodermic injection of morphine. Better effects probably will be obtained, and at least less liability to have secondary nausea and depression follow the anodyne influence of morphine, if when used hypodermically, it is conjoined with a small quantity of atropia. In using hypodermic injections of morphine, I always prefer to use minimum doses at first, and incur the inconvenience of repeating it at proper intervals, rather than the risk of suddenly and too strongly narcotizing the patient by larger doses.

In a few instances after the first twenty-four hours have passed, and the time come to procure a movement of the bowels, the use of enemas has failed to procure the necessary evacuations, and yet the abdomen has become largely distended with gases. Under such circumstances I have occasionally found the administration of a single powder, containing three decigrams each (gr. v) of calomel and bicarbonate of soda, followed in two hours by small but repeated doses of the liquid citrate of magnesia, to result in moving the bowels freely. My observations, however, have led me to avoid the administration of cathartics by the mouth, while there is any considerable inflammation of the mucous membrane of the stomach still existing in the more acute attacks, unless it becomes absolutely necessary from the failure of enemas, when they have been properly used.

After the acute symptoms have passed by, the febrile action ceased and the patient is capable of taking and retaining small quantities of bland, simple nourishment, the greatest care is necessary to avoid all errors in diet, such as allowing the patient too early to return to the use of solid food, or to indulge with any degree of liberality in the use of drinks. It is also necessary to avoid too early a return to active exercise. Rest and extreme care in the regulation of the ingesta, will contribute very much to shorten the period of convalescence and render the patient's recovery much more perfect than it would be were he indulged in an earlier return to more food, and more exercise. When the inflammation of the mucous membrane has assumed a chronic form, presenting the symptoms I have described as characterizing that stage of the disease, it is seldom that much benefit can be obtained from local bleeding or from the use of what are called alterative medicines. In the great majority of cases of diffuse chronic inflammation of the mucous membrane, I have succeeded in affording much relief to the patient, by the use of nitrate of silver in the form of pills, usually in combination with the extract of hyoscyamus and opium. A pill composed of six centigrams (gr. i) of the extract of hyoscyamus, three centigrams (gr. $\frac{1}{2}$) of pulverized opium, and two centigrams (gr. $\frac{1}{3}$) of nitrate of silver given each morning, noon, tea-time and bed-time, will usually produce a markedly beneficial effect. In some of these cases, I think the carbolic acid solution to which I have already alluded given in doses of four cubic centimeters (fl. ʒi) just before each meal time, and one of the pills of nitrate of silver, opium and hyoscyamus given half an hour after breakfast, dinner and at bed-time, has produced better results than either of these combinations given alone. So far as practicable, during the treatment of chronic gastritis, the necessary intestinal evacuations should be procured by the use of enemas given at stated intervals, once a day, or once in two days, instead of laxatives administered by the mouth. In many cases of the milder grades of chronic gastritis of considerable duration and accompanied by habitual constipation of the bowels, I have used a pill composed of the sulphate of iron extract of hyoscyamus, and extract of scutellaria, each six centigrams (gr. i) with two centigrams (gr. $\frac{1}{3}$) of gum aloes, and two of blue mass, given at each meal-time either before taking nourishment or within half an hour after, with a good effect upon the mucous membrane of the stomach, greatly lessening the distress after taking food, and in a few days establishing a regular and natural condition of the evacuations from the bowels. By taking from one to three of these pills daily, with careful regulation of the diet, drink, and exercise of the patient, they have been followed by recovery in many instances. Of course, I allude now, to those cases of a mild but persistently chronic character in which the inflammatory action is barely sufficient to cause every meal, or supply of

food to be followed by a sense of heat, fullness, more or less nausea, and either eructations or occasional vomiting of the food in a sour condition. These symptoms with some degree of tenderness on pressure, I regard as indicating a low grade of inflammatory action in the mucous membrane.

In many of this same class of cases I have succeeded well by giving the carbolic acid solution immediately before each meal and one of the same pills that I have just alluded to, only with the aloes increased to six centigrams (gr. i) instead of two (gr. $\frac{1}{3}$) in each pill, at bed-time. In such cases the carbolic acid mixture (see formula on p. 138) exerts a beneficial influence in directly allaying the morbid excitability of the membrane and by its antiseptic properties lessening the tendency to sourness and acidity, while the pill with the increased amount of aloes taken at night serves to regulate the evacuations from the bowels. In many cases of chronic gastritis, persistent in their tendency, and accompanied by considerable epigastric tenderness to pressure, some advantage may be gained by mild but protracted counter-irritation. This may be accomplished, either by a succession of small blisters over the epigastrium, or perhaps better and with less annoyance to the patient by the application of a mixture of croton oil one part, tincture of iodine two parts, sulphuric ether two parts. This painted over so much of the surface, as you wish to make sore, at first twice in twenty-four hours, will usually in two or three days produce an eruption of vesicles sufficient to constitute a mild form of counter-irritation. After the eruption has taken place, it may be kept up by repeating the application once a day, or once in two days, for such length of time as may be desirable. The treatment which I have usually found most efficient in relieving those cases which I have described as follicular inflammation of the stomach has consisted in the use of sub-nitrate of bismuth in doses of from three to five decigrams (gr. v to viii) either alone, or combined at first with some anodyne, of which lupulin and hyoscyamus are the best. Opiates in these cases, while they may temporarily help to allay irritation, seldom fail to induce within a few days, not only constipation, but a secondary nausea and depression that adds to the suffering of the patient, instead of affording any curative influence. The bismuth may be taken either immediately before the patient takes nourishment, or from fifteen to thirty minutes afterward. In cases in which there is a tendency to acid fermentation after taking food, I have thought it better to give bismuth in combination with an equal quantity of the bi-carbonate of soda, from fifteen to thirty-five minutes after taking food. In some of these cases, the oxalate of cerium, in doses of from two to three decigrams (gr. iii to v) given before each meal-time, produces better effects than bismuth. There are still other cases, in which I have found bismuth, oxalate of cerium, and oxide of zinc, all to fail in producing any permanent beneficial results; and yet the patients have been much relieved, and for a while entirely restored, by the use of pills composed of extract of hyoscyamus six centigrams (gr. i), and nitrate of silver two centigrams (gr. $\frac{1}{3}$) given just after each meal. In all these cases, whether using bismuth, oxalate of cerium, or nitrate of silver, due attention should be given to the procurement of regular evacuations from the bowels. In some instances the regular use of an enema, at a given time each day, will prove sufficient to obviate constipation, but in others it will be found ineffectual; and in such cases what I have called the tonic and laxative pill consisting of six centigrams (gr. i) each of extract of hyoscyamus, sulphate of iron, pulverized aloes, and blue mass, given at bed-time, each night, has seldom failed to establish in a few days a regular and natural evacuation once each day. The tonic properties of these

pills may be increased by adding two centigrams (gr. $\frac{1}{3}$) of the extract of nux vomica, or two milligrams (gr. 1-30) of strychnia to each pill. It is hardly necessary to add, that in all these cases of follicular inflammation, however chronic they may be, and whatever may be the impression of agents administered for their relief, it is necessary that the patient be cautious in the use of food and drinks; abstaining rigidly from all rich, highly seasoned dishes, coarse and indigestible vegetables or fruit, and taking only the plainer, simpler, and more easily digestible articles at regular intervals and in only moderate quantities.

It is necessary, also, that strong tea and coffee be avoided. A cup of light, or weak tea or coffee taken at meals, in many cases produces no perceptible inconvenience. All alcoholic drinks or remedies should be carefully excluded; especially is this important in those cases of follicular disease that have originated in individuals addicted to the habitual use of alcoholic drinks. My own observation does not enable me to agree with those writers, who in this particular class of cases especially, sanction a very moderate use of some of the lighter wines, under the impression that they enable the patient to retain nourishment better than they would without it. While this is apparently the case sometimes for a temporary period, I have never known it to be continued two weeks in succession without being followed by an aggravation of the symptoms; neither have I ever known a patient to continue the use of any variety of wine or beer, that obtained such kind of relief as enabled him to dispense with its use. In other words the apparent benefits derived from them have been either simply from the temporary anæsthetic effect of the small portion of alcohol upon the morbidly sensitive condition of the gastric nerves, or they have produced no benefits, but a direct and positive injury: consequently I have long since insisted upon their entire discontinuance in all this class of cases, and more particularly those which have originated primarily during their habitual use. In the treatment of the chronic gastric ulcer, the only other form of disease that I have included in the list of inflammations of the gastric mucous membrane, I have more evidence of the curative effects of nitrate of silver given in combination, either with hyoscyamus or small doses of opium, than of any other remedy. I have no doubt that when the disease is diagnosticated early, and the patient put upon a judiciously regulated diet, excluding all stimulating drinks, and irritants of every kind, and required to take nitrate of silver, commencing in doses of two centigrams (gr. $\frac{1}{3}$) combined with six centigrams (gr. i) of the extract of hyoscyamus, in the form of a pill, at each meal-time, and the doses of the silver gradually increased from time to time, until it reaches from three to five centigrams (gr. $\frac{1}{2}$ to $\frac{3}{4}$), the patient will usually find his obscure symptoms of indigestion, epigastric heaviness after taking food, gradually disappear, until there is no evidence of any derangement left. But in order to insure the entire success of remedies, the treatment must be continued a considerable length of time, usually not less than three or four months. Small doses of sulphate of copper, given in the same combination as I have mentioned for the nitrate of silver, have also sometimes proved equally beneficial, and in particular patients, more so than the nitrate of silver.

At the time of hemorrhage from gastric ulcer, I have found no remedy so speedily successful in arresting the further oozing of blood, as suitable doses of persulphate of iron. I have usually given it in doses of from six to twelve centigrams (gr. i to ii) dissolved in eight cubic centimeters (fl. ʒii) of water, repeated at first every thirty minutes, till the flow of blood appears to be checked, then at intervals of one hour, gradually extending

the time to two, three or four hours. If no return of the bleeding occurs for forty-eight hours, it may be discontinued. During the next week following these attacks of bleeding, I have used a pill, consisting of the sulphate of iron, six centigrams, (gr. i) with an equal quantity of the extract of hyoscyamus at each meal-time, and the same, to which was added one grain of aloes, at bed-time; the latter for the purpose of inducing a regular condition of the intestinal evacuations. I have thought the use of the sulphate of iron for one or two weeks, following attacks of hemorrhage from gastric ulcer, rendered the patient more secure against the return of hemorrhage, and prepared the way for the subsequent use of the nitrate of silver, with much better results than when the nitrate of silver was resorted to immediately after the cessation of the hemorrhage. But the proper regulation of the patient's diet, in these cases of gastric ulcer is of quite as much, if not more, importance than the medicines to be administered. All coarse and indigestible articles of food, and those of a heating, stimulating nature, should be rigidly excluded. The best diet in most instances, is that composed principally of light-bread and milk, oatmeal and milk, rice and milk, or other farinaceous articles. For variety, meat broths may be allowed, but when used, they should always be seasoned with salt to suit the taste of the patient, and not taken fresh or without salt. I have spoken of the administration of the persulphate of iron as the best remedy for the immediate arrest of hemorrhage from gastric ulcer; but there are many other remedies that may be used, and often with prompt relief to the patient. From six to twelve centigrams (gr. i to ii) of the acetate of lead may be given every twenty or thirty minutes, during the time of the flow of blood, and then continued at longer intervals for twenty-four or forty-eight hours, to prevent its recurrence. Vegetable astringents, such as gallic acid, fluid extract of rhatany, or the geranium maculatum root, may be used ; but so far as my own observations go, these vegetable astringents are much less reliable for the speedy arrest of this variety of hemorrhage, than either the acetate of lead, or the persulphate of iron. Ergotin is another remedy that, in recent times, has been used in this, as in many other varieties of hemorrhage, and sometimes with apparently prompt beneficial effects. It must not be forgotten, however, in estimating the effects of remedies, that in the large majority of these cases of gastric ulcer, the hemorrhage tends to cease spontaneously, within a brief period of time. Many patients, when attacked, living a few miles from their physician, have found the flow of blood to have ceased entirely before the physician has arrived, and without the agency of any remedies calculated to exert an influence over it. Simple rest in the recumbent position, avoiding all ingesta except the swallowing of pieces of ice or small doses of cold water now and then, has seemed to facilitate the arrest of the hemorrhage.

Duodenitis.—The mucous membrane of the next section of the alimentary canal, called the duodenum, is much less liable to attacks of an inflammatory character, than that lining the stomach. Yet occasional instances of all the various grades of inflammation, to which I have called your attention, as occurring in the stomach, are met with in the duodenum, and the changes that are produced during their progress, anatomically and symptomatically are identical with those which occur in the corresponding grades of inflammatory action in the membrane lining the stomach. The chief difference in the symptoms consists in the fact, that when the inflammation exists in the duodenum, the ingesta that the patient takes, whether food, drink, or medicine, does not produce its irritant effects so speedily. There is usually a brief period of time after

it is swallowed, more generally extending to thirty minutes and sometimes longer, before the nausea, burning or distress of any kind, or the disposition to vomit is induced. Not only is the effect of taking ingesta later in its development of the nausea, but that constantly existing does not culminate in efforts at vomiting, so frequently as in the more active grade of gastritis. Perhaps there is also, in nearly all the cases, a less intense burning quality to the pain, and more of a dull, heavy, oppressive feeling. These differences are simply what would naturally be inferred from the fact that the food being first taken into the stomach requires a little time to be passed through that organ into the duodenum, where it will come in contact with the inflamed surfaces. It is due also somewhat further to the fact, that the duodenal membrane is not apparently supplied as liberally with nerves of acute sensibility as the gastric membrane. Another difference consists in the fact, that the duodenal inflammations, whether acute or chronic, are liable to involve that portion of the membrane connected with the openings of the hepatic and pancreatic ducts, and sometimes to extension of the inflammatory process into the lining of these ducts by continuity, from the membrane in the duodenum. When this occurs the tumefaction of the membrane consequent upon the increased accumulation of blood, and of inflammatory exudations into its texture will sometimes so far obstruct the flow of these fluids as to cause their accumulation in the ducts, and sometimes their reabsorption. This, so far as the pancreatic fluid is concerned, gives no alteration of color and consequently affords us but little opportunity for determining with certainty what part it plays in the symptoms of the patient. But the obstruction in the opening of the hepatic ducts preventing the free flow of bile into the intestine causes reabsorption from the over-full ramifications of the ducts in the lobules of the liver, and speedily produces yellowness of the conjunctiva of the eye and subsequently of the whole cutaneous surface, with a dark brownish hue of the urine, and all other phenomena which are usually included under the term jaundice. When inflammation, either acute, chronic, follicular, or ulcerative is restricted to the membrane lining the duodenum, it not only produces the same changes pathologically that we have described as taking place in parallel grades of inflammatory action in the mucous membrane of the stomach, but they are amenable to the same modes of treatment in all respects; consequently, I need not repeat in reference to them what I have only just detailed as applicable to the inflammations in the stomach. There is, however, one form of inflammation commencing in the duodenum, and giving rise to an assemblage of symptoms which most writers have included under the name, gastro-hepatic catarrh, which requires some notice.

Duodeno-Hepatitis.—But my own observation, aided by one or two opportunities for post-mortem examinations, has convinced me that nearly all these cases of disease commence as subacute inflammation of the membrane lining the duodenum, and extend by continuity into the hepatic ducts, often following that membrane to their ramifications in the central portion of the liver, and therefore meriting the name not of gastro-hepatic catarrh, but of duodeno-hepatic catarrh, or preferably duodeno-hepatitis. Attacks of this grade of inflammation are most apt to be met with during the early part of adult life, and almost invariably during the transition of the seasons, spring and autumn, coincident with the prevalence of cold, wet, sleety, and changeable weather. In some seasons during the months of October and November, and in others, though more rarely in March and April, I have met with so many of these cases as to constitute a moderate epidemic. Some cases are met with every autumn. They have seemed

to me to originate almost wholly from the impression of cold, damp air, upon the cutaneous and pulmonary surfaces, restricting the exhalation of effete or waste matter through these outlets, and inducing, by reflex influence in part, and in part by direct action of the retained effete materials, irritation and congestion of the mucous membrane of the duodenum and hepatic ducts. That the chief cause is exposure to cold, damp, and frequent changes is rendered more evident from the fact that they not only occur at the seasons of the year when these conditions of the atmosphere are predominant, but they occur far more frequently in the male than in the female, and among laboring men or those whose employments cause them to take free outdoor exposure.

Symptoms.—The symptoms in these cases vary much in accordance with the degree of severity of the attacks. In the large majority of those that have come under my own observation, the first symptoms of which the patient complains, are a sense of heaviness, with an obscure feeling of soreness in the lower part of the epigastric region, and indifference to taking food, although in many instances, after commencing to eat, a fair quantity is taken. Accompanying the local symptoms are the general feelings of depression and indisposition to exertion.

From half an hour to an hour after food is taken, the feeling of fullness in the abdomen is increased, and generally accompanied by a sense of nausea, which lasts usually one or two hours, but passes off till food is again taken. Accompanying these early symptoms, the urinary secretion is usually diminished, and redder than natural. In many cases there is a white thin coat upon the tongue, there is very slightly increased heat of skin, a little dry look of the lips, but the pulse is hardly disturbed from its natural frequency. The symptoms, however, increase, and in about three days from their commencement there will be a moderate general feverishness often accompanied by dull pains in the head and back; the skin becomes dryer than natural, pulse accelerated ten or twelve beats faster than normal, an increased coating upon the tongue, with still greater dryness in the mouth, and a more constant feeling of heaviness or weight, and some degree of tenderness to pressure over the region of the duodenum. This heavy weight or load, as the patients call it, is much increased after taking food, and is usually accompanied by nausea, which is also uniformly increased by pressure over the epigastrium. In the more active class of cases, a little pressure with the hand will not only excite nausea, but attempts at vomiting; and after food is taken it is apt to be rejected by vomiting in from half to three quarters of an hour. Usually, the food thus ejected is more or less sour and mixed with some mucus. The bowels are usually moderately constipated, the urinary secretions still more scanty and higher colored than at first; not merely redder, but now tinged with a reddish yellow hue, from intermixture of the coloring matter of bile. Close examination at this time or a day later, will discover a yellow hue of the conjunctiva of the eye, often a bitter taste in the mouth, a feeling of dryness, and usually an entire loss of appetite. If the case is not interfered with by the end of a week after the patient begins to complain, in the large majority of cases the skin and eyes generally present a deep yellow color, and all the outward aspect of a full jaundiced condition from the retention and diffusion of the coloring matter of the bile, through all the tissues of the body. The urine now becomes dark brown, or yellowish brown, and in bad cases very scanty in quantity. The sense of heaviness and weight in the epigastrium, accompanied by some increased fullness, is quite distressing to the patient and usually compels him to keep a recumbent or semi-recumbent position. Under proper hygienic regula-

tions and mild treatment, most of these cases reach the climax of their severity in from seven to nine days; after which a very gradual improvement takes place, consisting in less distress on taking food, less disposition to vomit, and an increased secretion of urine, with the disappearance of the moderate grade of feverishness that had existed previously, and a steady diminution of the yellow hue of the skin and conjunctiva of the eye, until in from two to three weeks the patient usually returns to his natural condition both in general feelings and in the color of the surface. Occasionally a case is met with of such a degree of severity that the local symptoms of fullness, tenderness to pressure, nausea and vomiting when anything is taken into the stomach, become more constant and distressing, especially after the first three or four days.

The matters ejected by vomiting, aside from the food and drink which may be taken, are almost exclusively mucus, sometimes glairy and tenacious, at other times more thin or serous. At first it may be tinged with the coloring matter of bile, but after the first twenty-four or forty-eight hours there will cease to be any yellow or greenish hue to the matters vomited, and if the bowels are moved the evacuations are uniformly of a whitish or clay color, exhibiting no traces of the coloring matter of bile. The skin and eyes become early intensely yellow, the urine more nearly the color of beer and much diminished in quantity. These more severe cases also present much drowsiness, dry lips, deficient moisture in the mouth, coated, and sometimes dry tongue. In three cases that came under my observation during one season when these attacks were sufficiently numerous to constitute an epidemic, before the end of the first week the urine was nearly suppressed, there being no more than five or six ounces discharged in twenty-four hours ; the patients hardly susceptible of being aroused from their stupor, pupils dilated, breathing slow and sometimes irregular, pulse soft, easily compressed, abdomen somewhat distended and tympanitic, frequent attempts at vomiting especially when anything was taken even of the blandest character. In one of these cases, about the middle of the second week of the progress of the disease, the patient being about six months advanced in pregnancy, uterine pains commenced and proceeded until the fœtus and after-birth were both expelled, while the patient was so stupid apparently from the toxæmic effects of the retained elements of bile, that she was wholly unaware of what was taking place. No hemorrhage followed, and the uterus remained firmly contracted after the expulsion of its contents. But coincident with this, the secretion of urine became entirely suppressed, the use of the catheter finding none in the bladder. In about twelve hours after the expulsion of the fœtus, the matters ejected by vomiting or rather by regurgitation, became dark grumous, resembling very much the peculiar vomit of yellow fever. The pulse failed rapidly, the extremities became cold ; and entire collapse and death followed on the second day after the expulsion of the fœtus, or about nine days from the commencement of the disease. Another of the three to which I alluded was a female but not in a pregnant condition, and although during the second week the kidneys secreted no more than from two to six ounces in the twenty-four hours, and the patient remained so much stupefied as to be incapable of giving any answers to questions, with the extremities cold, pulse feeble, mouth entirely dry, skin more of a bronze than a yellow hue, abdomen somewhat tumid and tympanitic, nevertheless, after lying in this condition for three or four days, she began gradually to improve and finally recovered.

The third case was a man in the middle period of life and was under

the care of a neighboring physician. I saw him only in consultation during the last stage of the disease, when he presented symptoms almost identically the same as those of the other two patients just described, and the case terminated fatally about the end of the second week. In this case a post-mortem examination was permitted; the results of which I will mention when speaking of the pathological changes produced by this form of disease. The milder class of cases will, many of them, not show any jaundiced condition or diffusion of bile in the system until some time during the second week after the commencement of the attack. The patient complains throughout the whole course of the disease only of dullness, indisposition to exertion, dryness, and bitterness of taste in the mouth, moderate constipation of the bowels, scanty and dark colored urine, indifference to nourishment, and a heavy, dull feeling in the lower part of the epigastric region, and some nausea. This inclination to nausea is uniformly increased by any pressure upon the part, the heaviness and nausea are usually also increased for two or three hours after any nourishment is taken into the stomach. In these milder cases there is seldom actual vomiting unless very decided errors are committed in allowing too much food and drink. During the first week the discharges from the bowels are tardy and lighter colored than natural; but if vomiting is provoked, there may be evidences of bile mixed with the matters vomited. But after the middle of the second week even in the mildest cases that have come under my observation, the conjunctiva becomes yellow with the coloring matter of bile, the urine becomes a peculiar brownish yellow, and there appears some degree of yellowness of the skin generally. This, however, is often only moderate, and continues only for a few days before it again begins to decline. Most of these mild cases will complete their whole course in from two to three weeks ending in entire recovery, often with but little other treatment than a judicious regulation of the patient's food and drink.

Anatomical Changes.—The general symptoms which I have detailed as characterizing the commencement of the diseases grouped under the head of duodeno-hepatitis, are such as plainly to indicate an interference with the functions both of the duodenum and the liver, or rather the ducts of the liver. You will have noticed that all the earlier symptoms point to derangement of the functions of the duodenum, and that from two to eight or ten days elapse before there are evidences of interference with the flow of bile. This is, of itself, sufficient to indicate that the disease commences in the membrane lining the duodenum, and extends subsequently to the ducts of the liver, or in some way involves an obstruction of these ducts, and that all the symptoms attributable to retention of bile are secondary in their relations. The fatal case to which I alluded, on which a post-mortem examination was made, presented no important symptoms of disease in any of the organs or structures of the body, except two or three limited patches of slight inflammatory injection of the membrane lining the lower part of the stomach, and the whole lining membrane of the duodenum, and the hepatic ducts, up to their ramifications into the interior of the liver.

In this case the entire mucous membrane of the duodenum was intensely injected, some portions of it of a dark brownish color, and much softened, and other portions of a brighter red and less impaired in texture. The membrane lining the common duct, and all the larger branches was also in a similar state of intense injection, with tumefaction sufficient to close up the duct, and render it impervious, or at least nearly so, to the passage

of bile. The gall-bladder was moderately distended with bile but nearly natural in colo·, the central portion of the liver surrounding the entrance of the large vessels was tinged a paler more olive hue, slightly softened in texture, and apparently undergoing fatty degeneration. Nearly all of the smaller bile ducts, as they are connected with individual lobules of the liver, were distended with bile. The whole organ was moderately increased in size. No part of it had that injected condition of its vessels or exudations of an inflammatory character, corresponding with inflammation of the structure of the liver. The inflammatory process was apparently limited to the mucous membrane lining the ducts and the whole of the duodenum with the limited patches which I have mentioned, in the stomach. The swelling and enlargement of the liver, and the changes which it presented, appear to be attributable more to the continued engorgement of the bile ducts, and consequent interference with the molecular movements, than to any inflammation in the hepatic structures. The results of this examination, together with the clinical history of all this class of cases, render it obvious that the disease is essentially a mild grade of inflammation, involving primarily the mucous membrane of the duodenum, and sometimes limited to it; but in the large majority of instances entering enough into the hepatic duct to cause tumefaction and obstruction to the flow of bile, thereby adding the phenomena of jaundice to those of the duodenal disease. It is very rare that cases of this kind terminate fatally. The only one directly under my own care thus terminating, was the woman whose case I have already briefly described.

Diagnosis.—The three conditions with which the disease u der consideration may be confounded, are a moderate degree of gastritis on the one hand, a torpid or inactive condition of the liver, allowing the elements of bile to accumulate in the blood, until more or less of a jaundiced hue is induced, and direct obstruction of the hepatic ducts, from biliary calculi, the pressure of tumors, or any other mechanical impediment. From the first of these it is distinguished chiefly from the fact, that there is much less sense of burning heat in the epigastrium, the increase of heaviness, pain and nausea, are decidedly later after taking food than in cases of gastritis; all of the symptoms are of a more dull and obscure character. If vomiting occurs, instead of occurring promptly after taking ingesta, as in gastritis, it is more generally from half an hour to an hour later. From the second, or true torpor of the liver, it may be distinguished by simply noting the order in which the symptoms are presented, namely: the occurrence of weight or heaviness in the lower part of the epigastrium, with no sensations of either tenderness, weight or fullness in the right hypochondriac region, as is generally the case when there is any failure in the secretory action of the liver, either from congestion or from any other mode of arresting the action of the secreting cells.

The distinction is further developed by the fact that in the duodenal affection there are symptoms of a feverish character, and it progresses more decidedly as an inflammatory affection, reaching its culmination usually within a few days; while simple torpor or inactivity of the liver is usually accompanied by no febrile phenomena, only an obscure feeling of heaviness or weight in the right hypochondrium, rarely any nausea, disposition to vomit, or any sense of tenderness on pressure over the lower portion of the epigastric region. Then again, simple torpor of the liver, sufficient to prevent the evolution of the bile from the blood, allowing its elements to remain, is a very rare form of disease; so rare that I have met with very few unmistakable cases in the whole period of my practice. From primary obstruction of the hepatic ducts, either through formation

of biliary calculi, or other mechanical causes, the duodeno-hepatic disease is distinguished by the primary symptoms being located in the region of the duodenum rather than in the right margin of the epigastrium, and extending farther to the right, and by the almost uniform absence of febrile symptoms in connection with the formation of biliary calculi. The latter are usually slow in their formation, causing no active disturbance of the functions of the stomach and duodenum, and often giving rise to no symptoms which attract the attention of the patients until suddenly they are seized with pain, generally in the region of the gall-bladder, and which, in cases of much severity, after a period varying from an hour to one or two days, ceases as suddenly as it commenced, and leaves as a result more or less yellowness of the conjunctiva and of the skin, and a dark, reddish brown color of the urine, but at no time is it accompanied by febrile symptoms, or any other of the phenomena that I have described as belonging to duodeno-hepatic disease.

After the paroxysm of pain is passed, all the symptoms disappear, even the yellowness of the skin continues only two or three days, and the patient appears to be reasonably well until another paroxysm occurs, which may be in a few weeks, or not in as many months. Cases of mechanical obstruction produced by tumors or morbid growths in the abdomen are readily distinguished from cases of duodeno-hepatitis by the manifest presence of the tumors as felt through the abdominal walls. Yet, notwithstanding the apparent readiness with which the disease under consideration may be differentiated from either torpidity of the liver, or mechanical obstruction of the hepatic ducts, from the causes to which I have alluded, a large proportion of the cases are regarded by the patients as bilious attacks, and not infrequently the physician when called is also induced to regard the dull, heavy feelings of the patient, and more or less yellow appearance of the skin and eyes, as evidences of congestion, or inactivity of the liver. I have known very many of this class of cases, that have been placed under active treatment for supposed hepatic congestion, and sometimes subjected to the action of a very injurious amount of cholagogues and purgatives, which, instead of producing the desired bilious evacuations from the bowels, only hastened the patient into a diarrhœa, from extension of the irritation to the mucous membrane of the lower bowels causing extreme prostration, from which recovery took place very slowly.

Prognosis.—From what I have already said when speaking of the general course of the disease, and the almost uniform tendency to recovery, you will have already inferred, that, with the exception of very rare cases, the prognosis is favorable. In at least seventy-five per cent of all the cases that have come under my observation, simply the restriction of the patient to a very mild diet, gently opening the bowels once or twice with saline laxatives, and rest, recovery has taken place in from one to three weeks. Of the remaining twenty-five per cent, nearly all with judicious treatment aided by rest and proper regulation of the diet have also reached recovery in from two to four weeks. Very rarely the retention of the cholestrine and other elements of bile has caused an accumulation of these elements to such an extent as to produce fatal poisoning of the cerebral centers ; which is usually preceded by entire suppression of urine, and indeed, of almost all secretions.

I have seen a few instances in which the disease, either from neglect or mismanagement in the early stage has assumed a chronic form and continued for several weeks, in one twelve weeks, and in four or five other cases, periods varying from eight to ten weeks. When it assumes

a chronic form the patient usually becomes entirely free from any fever or increased heat, but rather presents a cool skin, cold extremities, a pinched or haggard appearance of the face, deep yellow or bronzed hue of the skin and eyes, and almost always accompanied by an eruption of prurigo upon the surface, attended by the most intolerable itching. This latter symptom is often so troublesome to the patients that they complain of it more severely than of all the other symptoms of the disease. Throughout this protracted period in the chronic form, the heaviness and weight in the epigastrium continues, with obscure tenderness on pressure; the latter almost invariably accompanied also by a sense of nausea. The bowels are generally costive but free from tympanitis. The patients are mentally dull, despondent, and gloomy, usually but little disposed to take food, and always in from half to three quarters of an hour after taking it complain that it increases their sense of distress. Occasionally when they have taken a little more than usual, in from one to two hours it will be rejected by vomiting. Almost invariably when vomiting thus occurs, there is more or less mucus with the matters ejected, while food appears only partially digested and sour. None of these chronic cases terminated fatally.

Treatment.—If what I have stated in regard to the nature of these cases is true the first indication for treatment is obvious, namely: the adoption of such measures as are calculated directly to lessen the morbid sensitiveness and vascular fullness of the vessels in the mucous membrane of the duodenum. If this is done early and effectually, there will occur no obstruction to the flow of bile, and consequently no subsequent jaundice, and the patient will recover by the end of the first week from the beginning of the attack. But unfortunately, the great majority of patients will not seek for the services of a physician until the first three or four days have passed, and the disease has already entered more or less into the hepatic ducts. This does not alter the indication for treatment. For you will observe the obstruction here is from the inflammation and consequent tumefaction of the lining of the duct; and the only rational mode of removing the obstruction is by removing the inflammation itself. The retention of the coloring matter of bile and other elements, so far from being evidence that the liver is torpid, and affording indications for remedies to act especially upon the secreting function of that organ, are evidences of just the reverse. For the secretion is carried on with the usual activity, the absence of any appearance of bile in the evacuations, and its diffusion through the system, are evidences that while being secreted with the proper activity, it fails to pass through its natural channels into the intestines, and is re-absorbed. Consequently, all remedies that are calculated to increase the secretion of bile, without at the same time removing the obstruction in the bile ducts, will only add to the amount re-absorbed and diffused through the system; and consequently to an increase of the jaundice.

The treatment which I have found most efficient for these cases has usually been as follows: If, on inquiry, I find the bowels have not moved for the preceding twenty-four or forty-eight hours, I give the patient a sufficient quantity either of the liquid citrate of magnesia, the sulphate of magnesia, or the Rochelle salts, to procure a moderate movement of the bowels. This is done more for the purpose of freeing the alimentary canal from accumulations of fæces, than for any other purpose, although these saline remedies undoubtedly have some influence in directly depleting, and thereby lessening the fullness of the vessels of the mucous membrane, as well as to empty the bowels. If the bowels, however, have been

moved sufficiently either by medicines that the patient has taken, or spontaneously, I do not give a laxative at the beginning, but place the patient directly upon the use of a powder composed of three decigrams (gr. v) of the compound powder of opium and ipecacuanha (pulv. Dov.), and an equal quantity of nitrate of potassium. Sometimes I add to this six centigrams (gr. i) of calomel, but more frequently it is omitted. If the latter is added, it is only to the first four doses. One of these powders is given every four hours, until from four to six have been taken. In the meantime, the patient is kept at rest, taking only liquid nourishment, such as beef-tea, oatmeal gruel, sometimes milk, or milk with lime-water, and at the end of this time, I administer another mild saline laxative. In the large proportion of cases, the evacuations following this laxative will be freely colored with the presence of bile. If so, it is almost always the case, that all disagreeable symptoms are decidedly relieved. By giving one of the same powders morning and evening for two subsequent days, and a mild laxative when required, the patient will reach the beginning of convalescence. If there is no further suffering after taking food, if the secretions from the kidneys are natural, the skin moist, tongue clean, and in all respects, the patient is free from feelings of sickness except a certain degree of debility and some yellowness, no more medication is usually required, but simply judicious regulation of the diet, and caution about returning too soon to active mental and physical labor.

But in some of the more severe cases, although the treatment is carried far enough to cause the operation of the saline laxative, after the exhibition of from four to six of the powders I have named, there will be no appearance of bile in the evacuations, and only a moderate lessening of the fullness, heaviness, and distress in the epigastrium. If such is the case, instead of giving the powders subsequent to this every morning and evening, repeat them at the same intervals as at first, namely: once in four or five hours, putting at the same time fomentations over the epigastric region, either by poultices, or by cloths wet in warm water or in some warm narcotic infusion. In cases of more decided severity I apply a blister over the most tender part of the abdomen, and with very good results. After this, simply keeping the bowels soluble, so as to have them move once, or at most twice in the twenty-four hours, carefully guarding against excessive purging, and if the urine is still scanty, giving the mixture of liquor ammonia acetatis, and nitrous ether, in doses of a teaspoonful diluted with water, three or four times a day, will be sufficient to conduct the patient to convalescence. In the cases which have assumed a decided chronic form, there has been some difficulty in affording them relief. One of the most obstinate that came under my observation finally recovered under the continuous use, for three weeks, of a prescription containing muriate of ammonium, and bichloride of mercury, dissolved in the syrup of licorice, in such proportions that in giving four cubic centimeters or a teaspoonful of the solution, the patient would get four decigrams (gr. vi) of the muriate of ammonium, and two milligrams (gr. 1-30) of the bichloride; this quantity was given three times a day. He had used a great variety of remedies, during the preceding two months, with but little advantage. I have used the same combination, in the same manner, in four or five other cases that assumed a chronic form, but of less duration than the one to which I alluded. In the majority of these, it produced also favorable results; but in two of them it added somewhat to the burning and irritation of the mucous membrane, which caused some nausea and subsequently vomiting. These two patients ultimately recovered under the influence of moderate doses of the sub-ni-

trate of bismuth, bicarbonate of soda, and a small proportion of the compound powder of opium and ipecacuanha, with an occasional laxative to move the bowels. In some of these cases of a chronic character, counter-irritation by the application of the combination of croton oil, tincture of iodine, and ether, applied over the epigastrium appeared to do good.

LECTURE LIII.

Enteritis, Acute and Chronic—Varieties, Causes, Symptoms, Anatomical changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: I shall next direct your attention to the inflammations occurring in the small intestines under the general name of *enteritis*. The first section of the small intestine called *jejunum* is rarely involved in inflammation. The second section, called *ileum*, is much more frequently the seat of disease. Attacks of inflammation may be limited entirely to the mucous membrane or to the muscular and peritoneal coats; or they may involve all these structures at once. The inflammation appears to commence in the middle and lower section of the ileum, in proximity to the ileo-cœcal junction more frequently than in the upper part. Sometimes it commences in, and may be restricted during its course to the cœcum, and the ileo-cœcal junction, and is then called typhlitis, to distinguish it from the more general inflammation of the ileum. In another class of cases, the inflammation either commences primarily or soon extends to, the areolar tissue exterior to the cœcum and ileo-cœlic junction causing tenderness, pain and swelling with more or less soreness directly above Poupart's ligament, in the right iliac fossa. Such cases are called peri-typhlitis. Attacks of inflammation in all parts of the small intestine occur more frequently in the warm seasons of the year, and in autumn, than in the winter and spring. They are met with, however, occasionally at all seasons of the year. They occur more frequently in children and youth, than during the adult period of life. They are especially rare in old age. Still, cases are met with at all periods of life, and perhaps with nearly equal ratio in both sexes. Under my own observation, however, more cases have occurred in males than in females. Aside from the influence of the seasons of the year, and that of age and sex, perhaps exposure to sudden and severe atmospheric changes, particularly to cold and wet, constitutes the most frequent exciting cause. In typhlitis, it has been supposed that the inflammation has its origin in the cœcum, or appendix vermiformis, as in many cases post-mortem examination has revealed the existence sometimes of hardened fæces, more frequently of such foreign bodies as cherry stones, apple seed, unbroken kernels of grain, that had been swallowed sometimes at a considerable time previously. In peri-typhlitis, the cause has been traced in some instances to the lodgment of similar bodies, primarily in the appendix vermiformis, which apparently became inflamed and ulcerated, thereby setting up inflammation in the areolar tissue immediately around it.

Symptoms.—As the word enteritis is applicable alike to inflammation in any of the coats of the intestine, and as the symptoms vary much in accordance with the variations in the particular seat of disease, it becomes

necessary to describe the symptoms of inflammation of the mucous membrane, as distinct from those of inflammation of the muscular and peritoneal structures. For the purpose of exactness, or to avoid being misunderstood, I shall denominate such cases as *mucous enteritis;* those involving the muscular coat, as muscular or rheumatic enteritis, and when primarily located in the peritoneal covering of the intestines, as peritoneal enteritis. The symptoms of acute and subacute mucous enteritis usually commence gradually, consisting at first of a sense of heat, irregular peristaltic motion in the abdomen, slight feelings of soreness particularly on sudden motion of the body, or from the jar of walking. The sense of soreness, however, and tenderness on pressure in the beginning of this form of inflammation is usually slight. In the course of twelve or twenty-four hours there will be more or less general febrile movements, indicated by a moderately increased heat and dryness of the skin, and acceleration of the pulse, which is at the same time, usually firm under the finger, small and corded. The respirations are usually slightly accelerated, the pain in the abdomen increased, especially the burning or sense of heat, and the temperature of the abdomen externally appears higher than the rest of the body and extremities. The pain is seldom of an acute lancinating character, but dull and accompanied by frequent, irregular peristaltic movements of the intestines, these movements being often accompanied by pains, which are called griping, but momentary in their duration, and usually accompanied by a sensation as though the bowels would move. During the last part of the first twenty-four hours, intestinal evacuations begin to occur. The first one or two passages will usually be fæcal, the first firm or consistent, the second softer, but yet not fluid. From this time the intestinal evacuations occur more frequently, varying from three to six or eight times a day, usually nearly fluid in consistence, sometimes of a gray or ash color, more frequently brownish, or reddish brown. Not infrequently the discharges contain little specks of a whitish substance, consisting of flakes of lymph, and detached epithelium. In most instances, each evacuation from the bowels is preceded for a minute or two by irregular abdominal pains. These vary very much in severity in different cases. Sometimes they are almost entirely absent. The tongue and mouth are less moist than natural, the first usually covered or partially covered with a whitish coat in the beginning, the tip and edges looking slightly redder than natural. If the disease continues three or four days without interference, the pulse becomes smaller, softer and more frequent, the extremities cooler, but the abdomen and trunk of the body maintain a higher temperature, the mouth is more dry, the lips looking parched and a little thin; countenance shrunken, and often a strip in the middle of the tongue, dry and more brown.

In some instances the abdomen becomes somewhat tympanitic, but more frequently not fuller than natural, and exhibits but little gaseous distension or tympanitis on percussion. To the touch or pressure there is almost invariably more or less tenderness. In mild cases the symptoms consist of a moderate grade of general fever, accompanied by diarrhœal discharges, continuing with but little change from five to seven days, when if the patient has simply been at rest, abstaining from promiscuous food, taking only bland and light nourishment, the symptoms begin to abate, the discharges become less frequent, the sense of heat in the abdomen and dryness of the mouth diminish, the tongue becomes more moist, and free from coating, and the urinary secretion returns more nearly to its natural condition, and by the middle of the second week the

patient is convalescent. The bowels either remain entirely quiet, or if discharges take place, they present a natural appearance. It is thus that very many cases of moderate mucous enteritis, every summer, run their course and terminate favorably in from seven to ten days, with little other treatment than simple rest, and proper regulation of the ingesta. But in more severe cases of an acute character, the symptoms at the end of the first week are liable to become aggravated. The tongue becomes more completely dry, the abdomen moderately tympanitic, more sensitive and tender on pressure, the discharges dark brown, and sometimes mixed with blood, the little masses of mucus occasionally contain sufficient blood to tinge the whole discharge of a distinctly reddish hue; pulse becomes soft, quick and irregular, the extremities cold and a little leaden or purplish hue, the eyes sunken, lips thin and retracted, a tendency for sordes to gather along the edges of the lips and exposed parts of the teeth, the patient's mind is often wandering, causing especially muttering in sleep; when left alone, he is inclined to be drowsy and dull, and the urine very scanty. If no change is made by treatment such a case will sometimes proceed rapidly from this point to complete collapse and death by exhaustion. The patient continues simply to grow weak, the extremities colder, pulse feebler, the mind more dull or wandering, until the sphincters relax, the discharges become involuntary, the chin drops, tongue falls back, breath becomes more and more irregular and obstructed by the relaxation of the muscles of the pharynx, and death ensues from pure asthenia. Within my own observation such results are of rare occurrence, and confined almost entirely to those patients who are living in bad sanitary surroundings, and failing to procure either reasonably good nursing or any suitable medical attendance. Occasionally during the highest temperature of summer, attacks will occur among children especially, having much the appearance of cholera morbus and cholera infantum at the outset, the more violent symptoms of which soon abate, leaving a genuine mucous enteritis which sometimes progresses rapidly to a fatal termination. Between the two classes of cases I have described, one tending spontaneously to recovery, the other sometimes proceeding to a fatal result, you will meet with a large number presenting symptoms of a severe character during the first week of their progress, abating during the first half of the second week as though convalescence was approaching, and at the end of three weeks, nearly all the more active symptoms will have disappeared, leaving the bowels still loose, with considerable impairment of flesh and strength, but not so much as to prevent the patients from being up some each day. These are cases commencing as acute or subacute inflammation, and which terminate, not in recovery, but in the chronic form of the disease. They are liable to continue an indefinite period of time. Some of them under favorable circumstances, after continuing three or four weeks, gradually improve until they end in recovery. Others, however, after continuing nearly stationery for three or four weeks, during which the patients are able to be up and dressed, again begin to retrograde; losing flesh and appetite,the discharges becoming more frequent, sometimes giving indications of intermixture of muco-purulent material in the first portion of the evacuations, either with or without a tinge of blood, a renewal of moderately increased temperature, especially of the abdomen, small weak pulse, cold extremities, rather haggard expression of countenance, and finally fatal exhaustion. Intermediate between those that thus run to a fatal termination, and those continuing five and six weeks and ending spontaneously in recovery, there is still a class that maintain a moderate degree of diarrhœa, sufficient to continue the impairment of

strength and prevent a return to the active duties of life, and yet not sufficient to cause any rapid degree of exhaustion, and in which condition the patients may remain one, two or more years, with but little change from month to month. The symptoms and progress of these cases as I have stated them, represent the natural progress of the disease when not actively interfered with by judicious medication. When the latter is brought to the aid of the patient, there are very few cases of those that have assumed a decidedly chronic form, but that may be conducted to an ultimate recovery.

Anatomical Changes.—The anatomical changes which take place during the progress of acute and subacute mucous enteritis, correspond in all respects with the changes that I have already described as taking place in the mucous membrane of the stomach and duodenum. In the first stage, there is intense congestion, causing redness and more or less tumefaction of the membrane, with subsequent increase as the disease progresses, the redness changing more to a brown or dark hue in many places, with softening or impairment of the texture and detachment of much of the epithelial layer, leaving abrasions or superficial ulcerations. In the subacute cases and especially those that run a more protracted course, exudation of liquor sanguinis, or plastic material of the blood, takes place, into the sub-mucous or connective tissue, and into the texture of the membrane as well as upon the free surfaces. In such cases, instead of softening of the membrane it becomes more thickened and hardened, but generally presents the same disturbance of the epithelial layer, and the same marked abrasions upon the surfaces as in the more acute cases. When the disease assumes a chronic form, the diffused redness that accompanies the acute and subacute stages subsides over the larger part of the membrane, allowing it to return to a more natural color and appearance; only patches remain red, thickened, more or less hardened in texture, and pretty uniformly present distinct and deep ulcerations upon their surface. Some of these ulcers in cases of long continuance have been found to extend more deeply into the coats of the intestines, destroying not only the mucous membrane, and submucous areolar tissue, but also the muscular coat to the peritoneum. Sometimes, though quite rarely, the peritoneum itself is perforated, bringing on acute general peritonitis as the immediate cause of the death of the patient. In many of these cases, both of a chronic and acute form, where death has resulted, there is a more or less injected and reddened condition of the peritoneal membrane over those parts of the intestine that are most involved in the disease. The changes which I have described will explain to you the progress of those cases that commence in the acute form and terminate in the chronic. The subsidence of the more severe symptoms marking the termination of the acute stage, is the time when inflammation undergoes resolution and disappears from a large portion of the mucous membrane; leaving only limited patches where, from the thickening and induration, and more decided ulcerative changes of the surface, resolution can not take place as readily; and in consequence of this, the discharges in their milder form are continued after the general symptoms have undergone the improvement I have mentioned. In many of the cases, these patches continue slowly to improve, the abrasions are repaired, while the exudative material is removed by disintegration and absorption, and convalescence is reached in from four to five weeks, while in those cases that linger longer, little or no reparative action takes place in the inflamed and ulcerated patches, the ulcerations tending to increase instead of cicatrizing. It is thus they run a more protracted course and the patients ultimately die from exhaustion.

Diagnosis.—Mucous enteritis presents symptoms, as you will have noticed, sufficiently characteristic to distinguish it from nearly all other affections of the alimentary canal. From typhoid fever it is distinguished by the well marked prodromic or forming stage of the latter, followed as it usually is by a progressive development of fever, and rise of temperature day by day, neither of which correspond with the beginning and progress of simple enteritis. Cases of the latter have none of the dull heavy expression of countenance, suffused flush of the face, and steadily increasing temperature that belongs to the general fever. And during its subsequent progress the dry bronchial râles so generally present in the second stage of the typhoid disease are absent, as are also the rose colored spots upon the cutaneous surface. From dysentery or inflammation of the colon it is distinguished by the lower degree of fever, the less frequent and painful character of the discharges, and the less intermixture of mucus and blood with the evacuations. From peritonitis, either of that part of the peritoneum covering the intestines, or lining the abdominal parietes, mucous enteritis is distinguished by the lower grade of fever and especially by the absence of lancinating, sharp pains, excessive tenderness to pressure or to any free motions of the body, and of early and decided distension of the abdomen. Of the prognosis in mucous enteritis in its different degrees of severity, I have already spoken sufficiently when giving its clinical history.

Treatment.—The leading objects to be accomplished in the treatment of mucous enteritis are, to directly diminish the morbid sensitiveness of the mucous membrane, lessen the frequency of the discharges, and promote the natural eliminations from the skin and kidneys. Cases may be met with, though they are certainly rare, in which sufficient enteric irritation exists to produce more or less diarrhœal discharges, and yet the first part of the ileum remain filled with consistent or hardened fæces. If such a case should present itself, it is evident that a moderate movement of the bowels by such laxatives as would be likely to produce the least griping or local irritation in the inflamed parts, should constitute the first item in the treatment. Experience has shown that the fæces very rarely accumulate and remain stationery in the upper part of the ileum or any part of the jejunum. Indeed, the contents of the bowels rarely become consistent until they have passed below the middle portion of the ileum; and I have no recollection of ever seeing a case of mucous enteritis, in which I could detect, either from the history of the case, or from the condition of the abdomen, the retention of hard fæces in any part of the alimentary canal. And I am fully satisfied that the practice of many, to commence the treatment by a saline laxative, merely for the purpose of being sure that the contents of the bowels have been removed, is calculated to do more harm than good. I pretty uniformly prescribe, first, a combination of some anodyne with an alterant, and give sufficient to first place the patient at ease from pain, and the alimentary canal in a condition of quietude, with a view of keeping it at rest, for at least eighteen or twenty-four hours. At the same time remedies are given for the purpose of gently promoting the action of the skin and kidneys.

For all these purposes I have generally directed a powder composed of pulverized opium six centigrams (gr. i), pulverized ipecac uanha, one to two decigrams (gr. i to iii), mild chloride of mercury six centigrams (gr. i) to be given every three hours; and an equal mixture of liquor ammonii acetatis and nitrous ether, of which four cubic centimeters (fl 3i) are given diluted with a little water, between each of the powders. The latter will usually promote the action of the kidneys and skin,

while the former will control the intestinal evacuations and allay the pain, to such an extent, that in most cases, at the end of twenty-four hours, the patient is found quiet, often inclined to sleep, with the abdomen nearly free from tenderness, the skin moist, the pulse a little quicker than natural, and the temperature one or two degrees above the natural standard. If this be the case I discontinue the further use of the powders, and simply leave the patient upon the use of the liquid preparation, once in three hours until eighteen hours more have passed, when if spontaneous evacuations from the bowels do not occur, I promote a movement by an enema of warm water; or if this can not be conveniently used, I give a mild dose of sulphate of magnesia or Rochelle salts, aiming to give only enough to procure one or two evacuations: and always leaving instructions to give the patient either three or five decigrams (gr. v to viii) of the compound powder of opium and ipecacuanha, or its equivalent of some other opiate, as soon as the bowels have been moved the second time, if the discharges are free, or the third time if they are only moderate. The anodyne is to be repeated every time the bowels move subsequently, until they again become quiet. By such a course of treatment, accompanied by entire rest of the patient in a recumbent position, and restriction to bland, simple nourishment, such as lime water and milk, very thin wheat flour and milk gruel, sometimes beef tea, or mutton, and chicken broth in small quantities; the use of cold mucilaginous drinks, also limited in quantity, or if the patient be very thirsty during the early part of the treatment, allowing bits of ice to be used instead of much drink, in nearly all cases that come under treatment in the early stage, the disease is arrested, the symptoms of inflammation rapidly disappearing, and the patient becoming convalescent in from three to five days. But if the disease has been in progress longer before it has come under observation, having already passed, in the acute cases, either to the stage of softening with more or less abrasion of the membrane, or in those of a milder grade to the commencement of the chronic stage, it is not possible to procure so prompt and early an arrest of the disease: and such remedies must be chosen for further treatment, as are calculated to procure, in addition to the necessary anodyne and alterative influence, an effect upon the capillary vessels of the mucous membrane, different from that of mere astringency.

For this purpose, I have found no combination of remedies better, in the majority of cases, than the emulsion, containing oil of turpentine, tincture of opium, gum arabic and sugar. The formula I have generally used is the same that I have mentioned, when speaking of the treatment of the middle and advanced stages of typhoid fever, and consists of the oil of turpentine twelve cubic centimeters (fl. ʒiii), oil of wintergreen two cubic centimeters (fl. ʒss), tincture of opium fifteen cubic centimeters (fl. ʒiv), pulverized gum arabic and white sugar, each twenty grams (ʒv), rubbed well together, with the addition of water, one hundred and twenty cubic centimeters (fl. ℥iv). If the ingredients are well mixed, they make a uniform or homogeneous emulsion, of which four cubic centimeters (fl. ʒi) may be given at a dose, and repeated every four or six hours, according to the frequency of the evacuations, or the degree of quieting effect that is desired. If the urine remains scanty and the skin dry, the patient may take suitable doses of an equal mixture of liquor ammonii acetatis, and nitrous ether, between each of the doses of the emulsion. Under the influence of these remedies, nearly all the cases will improve regularly from day to day until the evacuations from the bowels become natural. When this occurs, the emulsion should be suspended, allowing only the diaphoretic mixture to

be continued until convalescence is complete. If, during the treatment, the patient has been allowed little or no ingesta, but the wheat flour and milk gruel in small quantities frequently repeated, alternated sometimes with animal broths, such as beef tea, it will be found almost uniformly, that the symptoms of the inflammation of the mucous membrane subside, the discharges become natural, the febrile symptoms disappear, the tongue becomes clean and the patient is convalescent, in from four to six days. Occasionally you may meet with a case of this variety of inflammation of the membrane lining the ileum, in which the turpentine and laudanum emulsion will not be tolerated by the stomach. In such instances I have found a pill composed of carbolic acid fifteen milligrams (gr. $\frac{1}{4}$), pulverized ipecac, thirteen centigrams (gr. ii), pulverized opium six centigrams (gr. i), a good substitute for the emulsion, giving one pill under the same circumstances, and with the same frequency, that the doses of the emulsion were recommended, and they have rarely produced either nausea, or any unpleasant symptoms. On the contrary, they have been followed by a steady lessening of the pain and restlessness, and the discharges have improved in their number, and in their quality, until in a few days convalescence was established. When inflammation in the ileum assumes a chronic form, either as the sequel of an acute attack, or primarily, it is seldom advantageous or necessary to give the patient alterative doses of the mercurials in connection with the opium, as I have stated in the beginning of the acute form of the disease. The greater part of the cases that have come under my observation, have either resulted from severe attacks of a more acute character, or have followed as the sequel of typhoid or typho-malarial fever. During the progress of the war for the suppression of the rebellion, when there were large numbers of soldiers, who were more or less under the influence of causes productive of diarrhœas, dysenteries, typhoid fever, and scorbutus, there occurred many cases of the most severe and protracted form of chronic diarrhœa as the sequel of attacks of acute general diseases. Many of the cases belonging to the two first classes that I have mentioned, yielded readily to the proper regulation of the diet, and the use of the turpentine and laudanum emulsion, or the pills of carbolic acid, ipecac, and opium; only being careful to adjust the frequency of the doses to the degree of frequency of the discharges. In most instances it is sufficient to give four doses of either of these prescriptions in the twenty-four hours. There are some cases in which a prescription containing aromatic sulphuric acid, sulphate of magnesia, and tincture of opium, each four cubic centimeters (fl. ʒi), to thirty cubic centimeters (fl. ℥i) of water, given to adults in doses of four cubic centimeters (fl. ʒi), will be found equally efficient with either of the other prescriptions that I have named, and may be given more freely to such cases as are inclined to secondary nausea from the effects of opiates. The cases that follow typhoid fever are mostly dependent on the ulcerations of Peyer's glands, which have remained after the subsidence of the general fever. It is particularly in this class of cases that the nitrate of silver is to be regarded as a valuable remedy. I have used it in many of the cases in the form of a pill, usually in doses of two centigrams (gr. $\frac{1}{3}$), combined with six centigrams (gr. i) of opium, at first; but when the discharges were held more in check, I have reduced the opium to half that quantity. A pill containing these ingredients may be given, at first, every four hours. If the effect is favorable and some relief is obtained, the time can be subsequently extended to six hours, or even to eight hours. It is an object of importance, in these cases to regulate the diet of the patient.

The principle on which the diet should be regulated, is that of using such articles of food as will be sufficient in their composition to afford the patient the elements necessary to give complete nutrition, and in a form to be taken up as perfectly as possible in the stomach and first part of the alimentary canal, leaving the least possible residue to pass through the middle and lower bowels.

In the great majority of cases, I have been able to find nothing that answers the purpose better than well prepared wheat flour and milk gruel. Sometimes oatmeal gruel, soft boiled rice and arrow-root, with moderate quantities of the animal broths, will be well borne, and may be used to a limited extent alternately with the flour and milk. But every time this class of patients indulge in taking promiscuously the coarser articles of food, the discharges become more frequent, with more pains in the abdomen and an aggravation of all the symptoms. That class of cases, which I met with, chiefly during and a few years subsequent to the war, among the soldiers, presented some conditions that were different from ordinary chronic diarrhœas. The patients pretty uniformly presented a very pale, bloodless or anæmic aspect; a clean state of the tongue, frequently a slightly œdematous condition of the feet and ankles, a very variable state of the appetite, and a pretty uniform increase of the peristaltic motion and discharges soon after eating. Very generally these discharges were thin, reddish brown, or of a pale ash gray color. In most instances if the intestinal discharges were allowed to stand a little time in the vessel and the thinner part poured off, the thicker part in the bottom would contain small masses of mucus and specks of red blood, with more or less muco-purulent material. But this was not present in all cases. The habit of evacuating the bowels speedily after taking food seemed to keep the intestines habitually empty. And, I observed, very uniformly, that whenever remedies were administered sufficient to arrest peristaltic motion, even for eighteen or twenty-four hours, the patients became very uneasy from the sense of distension or undue fullness of the abdomen, creating the idea that the discharges had been stopped too suddenly. This disagreeable sense of fullness was not, by any means, accompanied by an actual fullness. In very many of them there was no distension of the abdomen, but rather a lank condition and yet the sensation of the patient was that of overfullness. Similar results almost invariably followed the use of the more astringent class of remedies in connection with opiates. And, if the restraining influence of the opium and astringents was continued for thirty-six or forty-eight hours, no decided absorption of the contents of the bowels took place, but increased discharges occurred as soon as the effect of the medicine had ceased—the quantity being proportioned to the length of time they had remained quiet.

Very few of this class of patients were benefited permanently, by any variety or combination of astringents and anodynes that I could devise. Some of them were benefited and ultimately cured by the careful regulation of their diet, and the protracted use of the nitrate of silver and opium pill; usually given at first four times in twenty-four hours diminishing the number according to the improvement that took place. A larger number, however, were benefited, and some of them ultimately cured, by using a powder composed of sub-nitrate of bismuth, three decigrams (gr. v), sub-carbonate of iron thirteen centigrams (gr. ii), and pulverized opium six centigrams (gr. i), usually given just before each meal and at bed-time, diminishing the number according to the degree of restraining effect produced. It was during the time that these soldiers were returning from the army with this form of diarrhœa and coming

frequently under my observation, that I was led to use bromine as a remedy in their treatment. It was first suggested to me by a medical officer in charge of the military hospital at Rock Island during a visit to that encampment, and I found it a very valuable remedy in many of this class of cases, as well as in cases of chronic dysentery originating under similar circumstances. The formula that I then used was bromine one cubic centimeter (min. xv), bromide of potassium twelve grams (℥iii), distilled water one hundred and twenty cubic centimeters (fl. ℥iv), of which four cubic centimeters (fl. ℥i), were given (further diluted with water at the time of administration) four times a day. This remedy uniformly caused an alteration in the color of the passages, to a bright yellow, and usually was followed by a gradual diminution in their number, with increase of consistency, until in from one to two weeks some cases of long standing were brought very nearly to a natural condition. The greatest objection to the remedy is the extreme pungency of the bromine, and the difficulty of concealing it sufficiently to prevent its being annoying to the patient during its administration.

Typhlitis.—Owing probably to the greater tendency of fæces, and, perhaps, of foreign bodies or indigestible substances to accumulate in the cæcum, until they become sources of irritation, inflammation of limited extent has been found to occur more frequently in that part of the intestine and in the ileo-cæcal junction, than in any other. When it has been thus limited, it manifests itself by pains and soreness in the right iliac region, and has been termed typhlitis to distinguish it from the more general inflammation of the mucous membrane of the ileum. But the consequences of inflammation here, in all its different grades, are the same as in any other part of the membrane, and it requires no difference in its management. When the patient is attacked with symptoms pointing to inflammation in this particular place, more careful examination should be made in reference to the evidences of retained fæcal accumulations, in the cæcum. It is by no means always the case that such accumulations exist. A majority of those that have come under my care, neither on close examination by palpation, nor inquiry into the nature, amount or degree of fæcal evacuations previous to the commencement of the pain, have indicated the existence of any accumulation whatever. But when it is evident that either hardened fæces, or other substances exist there, it is best to commence treatment by using large enemas, filling the rectum well with a view of inviting freer evacuations from the bowels. If you begin by giving physic by the mouth and thus establish increased peristaltic motion above, it is liable to be followed by greatly increased pain, and sometimes, the establishment of irregular contraction of the circular fibers of the intestine, thereby obstructing the further motions of the bowels, instead of facilitating the evacuations that are desired.

Having thus formed an obstruction, all further administration of medicines by the mouth are usually followed by troublesome vomiting, and a more rapid increase of all the local symptoms of inflammation, until either the patient becomes thoroughly prostrated, or symptoms closely resembling invagination supervene. Such results can almost always be avoided by relying mainly upon the remedies used as enemas to invite evacuations, while those administered by the mouth are decidedly soothing or anodyne in their influence, and on local applications of an anodyne character, such as cloths wet in warm narcotic infusions. In a few instances of this kind where the local pain in the ileum and the ten-

derness on pressure, with some tumefaction of the part, indicated decided inflammation, the pains were paroxysmal and severe, and the movements of the bowels entirely arrested, although evacuations had been free up to the time of commencement of the attack, thereby showing that there was no injurious retention of fæces. Yet the administration of medicines by the mouth, of a laxative character, was followed by vomiting, until the severity of the symptoms created decided alarm, and apprehension of invagination, or some permanent intestinal obstruction. I have found very gratifying relief by the administration of enemas containing hydrate of chloral and belladonna. Fifteen decigrams (gr. xxiv) of the hydrate of chloral with fifteen cubic decimeters (min. xxiv) of the tincture of belladonna, suspended in about one hundred and twenty cubic centimeters (fl. ℥iv) of milk-warm water may be introduced into the rectum as an enema, with instructions to the patient to retain it as long as practicable. If retained, it will be generally followed within half an hour by a decided sense of relief from the pain the patient has been suffering, and more or less disposition to sleep. This relief from pain and tendency to rest has, in some instances where I have used it, continued from two to three hours. When the patient has again begun to complain of a return of the paroxysms of pain and uneasiness the enema has been repeated. In one instance, the second enema being retained, no further vomiting nor pain was suffered for twelve succeeding hours; but the patient's pupils became dilated, mouth somewhat dry, and face a little flushed from the effects of the belladonna. At the end of that time two or three fæcal evacuations occurred from the bowels, followed by a very moderate degree of griping pains and increased restlessness. Enemas containing half the quantity of chloral and belladonna were given, with instructions to repeat them at intervals, once in every six or eight hours, if pain should return sufficient to require their use. During the succeeding twenty-four hours a number of these smaller enemas were used, followed by moderate evacuations from the bowels, and a rapid subsidence of all the inflammatory symptoms. For mention of several cases of a similar character treated chiefly by the use of enemas of chloral and belladonna, I may refer you to a small volume of "Clinical Lectures on Various Important Diseases," * written by me a few years ago.

Perityphlitis.—In the same location where typhlitis is manifested, we meet with cases, not infrequently, in which patients are attacked rather suddenly with more or less acute pain in the ileum, usually just above Poupart's ligament, sometimes extending higher up in the direction of the ascending colon or centering in the lower part of the iliac region. The pain is usually acute and paroxysmal, accompanied by manifest tenderness to pressure externally, and within twelve to eighteen hours, more or less tumefaction or swelling in the part. Sometimes at the commencement of the symptoms, the patient will have one or two evacuations from the bowels, not unnatural in their character. Very generally, the bowels have been free from constipation, at least several days previously, and no diarrhœa. The occurrence, however, of the pain, swelling, and tenderness to pressure in the iliac region is usually followed by an arrest of further intestinal discharges. And if the patient is not relieved, in most instances the pain and swelling both continue to increase until they occupy one third of the lower section of the abdomen, and the distension becomes considerable, with distinct hardness, as well as tenderness over the central point in the region of the iliac fossa. Meantime, the patient has become restless, pulse quick, respiration more hurried, with almost constant

* Second edition, pp. 129 to 134.

sense of nausea and prompt vomiting of everything that he has taken in the form of drink or medicine. At first the matters vomited are simply the contents of the stomach, sometimes tinged with the coloring matter of bile, either yellow or green, and more or less bitter to the taste. Subsequently, they become more decidedly of a greenish hue, acid taste; and if the case continues two or three days without relief, the abdomen becomes largely distended, as if peritoneal inflammation had extended over the whole surface of that membrane. The pulse becomes uniformly small, weak and quick, the extremities cold, surface bathed in clammy sweats, the eyes more or less sunken, the mind frequently wandering, dull and despondent; vomiting and regurgitation from the stomach of a dark grumous fluid takes place; and at a little later period, entire collapse and death follow. In many cases, however, even with but little treatment during the first two days while accompanied by the symptoms I have mentioned, before extreme prostration and extension of the symptoms of peritonitis over the abdomen occur, spontaneous evacuations take place from the bowels, and most frequently go to the extent of becoming thin diarrhœal discharges: after which the tumefaction gradually diminishes, the tenderness also abates, the pulse improves, and in three or four days the patient has reached a condition of convalescence. In the greater proportion of these cases, the latter result will be reached, if they are properly treated from the commencement of the attack. But there is an intermediate class of cases, between those that go directly on to entire collapse and death, and those which recover, either spontaneously, or by the aid of treatment, in which about the end of the first week of their progress, the general tumefaction of the abdomen ceases, the increase of febrile heat gradually diminishes, some evacuations take place from the bowels from day to day, but there remains, notwithstanding, a distinct well defined tumefaction over the iliac region, more or less hard and tender to pressure, and in a few days more, there is found to be evidences of deep-seated suppuration.

The suppurative process now continues, and the patient remains as in any other case of suppurative inflammation, emaciating more or less rapidly, losing strength, and in some cases the symptoms are more of a hectic type of febrile movement, accompanied by sweats, particularly during the latter part of the night. Usually during the second week of the progress of the case, or at longest the third, the abscess which has formed will spontaneously open into the intestines and discharge its contents, which are easily recognized as pus, sometimes tinged with blood and accompanied by some fæcal matter, in considerable quantities. Such discharge is followed by direct subsidence of the swelling and fullness in the iliac region. In other cases the opening instead of being into the intestine will be into the peritoneal cavity, producing the usual rapid development of general peritonitis, extreme prostration, and speedy death. Instances are on record in which the abscess has found its way by the ulcerative process, into the bladder, discharging its contents through that viscus and urethra, with the urine. But, in the larger number of cases, the tendency of the abscess is to the surface. Most generally during the third week in the progress of the case fluctuation will become evident on proper examination, and by a free incision the matter may be discharged, and in most cases if the physician is sufficiently careful to give full drainage to the abscess, and subsequently, judicious antiseptic treatment with such nourishment and mild tonics as will sustain the general condition of the patient, a slow but pretty certain recovery takes place. These cases, which I have been describing, and which may pro-

ceed to the various terminations mentioned, are termed in your books, perityphlitis. They consist essentially in an inflammation commencing exterior to the cæcum, in the connective and areola tissue surrounding that portion of the intestine. The inflammation involves the coats of the intestine, sufficient to cause an arrest of peristaltic motion, and consequently, very generally an arrest, at least in the earlier stage, of the intestinal evacuations. And occasionally, it extends, as I have already mentioned in speaking of the symptoms, to the mucous membrane, sufficient to develop moderate diarrhœal discharges in the middle and latter stages of the progress of such cases. The inflammation, as you will infer from the symptoms I have described, in the milder cases terminates in resolution, and simple disappearance of the exudative material, with no bad consequences, or *sequelæ*, remaining. In other instances it occasions sufficient obstruction to the intestines, to wholly arrest the evacuations until vomiting becomes excessive, and prostration is induced to a degree that is dangerous to the life of the patient, and by the extension of the inflammatory process to the peritoneum, may terminate fatally; or, as in a large proportion of the cases is the fact, instead of these results, the inflammation in the areolar tissue proceeds to suppuration, the formation of an abscess, which may spontaneously break in any of the directions I have mentioned, but most generally tends toward the surface, and consequently comes within the reach of the practitioner or surgeon, and if properly attended to, is capable of being relieved in time for the restoration of the patient. I have met with many of these cases of perityphlitis, but in only one instance under my own care has the disease proceeded to a fatal termination. This was the case of a young man, attacked with the disease in the usual form, but who did not come under my care until the end of the first week of its progress, when suppuration had already taken place. I proposed an early incision, but his own timidity and that of his mother caused it to be postponed from day to day, longer than was judicious.

And, although at the end of the second week of its progress, it was opened and freely discharged its contents and for about one week progressed favorably with every prospect of recovery, yet at the end of that time, it was observed that the purulent discharge which had previously been diminishing began to be more copious, assumed a slightly greenish hue and became offensive. In one or two days more fæces were found to be mixed with the pus that was discharging from the opening. From this time on fæcal matter and gases passed with the pus from the abscess, and notwithstanding all the care we could give, the patient gradually emaciated, and after lingering three or four months he was removed to his home in Michigan, where he died from asthenia, with the fistulous opening still remaining.

Treatment.—In the management of this class of cases, if you are called early, I must caution you against the common practice of commencing the treatment by the administration of active cathartics. I have known these cases to be very much aggravated, and early and excessive vomiting induced, followed by inflammation and swelling over a large part of the abdomen by the administration of cathartics to force active and free evacuations from bowels. You must bear in mind, that inflammation commencing in the connective tissue, exterior to the coats of the intestine proper, has a strong tendency to induce rigidity or contraction of the circular fibers of the muscular coat, and that such contraction presents an obstacle to the passage of fæces, consequently all administration of cathartics while such contraction remains only increases the peri-

staltic action from above downward, greatly increasing the pain and adding to the danger that the contracted part will be forced into the uncontracted part below, thereby commencing an invagination that would not otherwise have taken place. The bad results of the common practice of commencing the treatment of all such cases with a determined effort to evacuate the alimentary canal by cathartics, led me many years since to take an entirely different course, namely, to bring the patient as speedily as possible under a sufficient anodyne influence to place the whole of the upper part of the alimentary canal in a state of entire rest and relaxation. For this purpose the preparations of opium are of great service, and if they can be conjoined with any other remedies that may lessen their tendency to produce secondary nausea and vomiting, it will be better to order them so combined, and given in sufficient doses to produce positive relief to the pains, and repeated often enough to secure as complete rest for the patient as possible, for at least twenty-four or thirty-six hours. Some aid may be obtained by keeping the parts covered externally with warm narcotic fomentations. After the patient has been kept at rest as fully as possible, until the soreness has much diminished, I usually administer enemas of sufficient quantity to fill the rectum well, consisting of warm water rendered a little stimulating by the addition of common salt or sulphate of magnesia. If the first enema passes off without producing any fæcal evacuations, after waiting about one hour, I order another.

And it is very rare that I have had to repeat the enemas more than two or three times, before getting satisfactory evacuations. After the bowels have been freely moved if there is little or no return of the pain and much less tenderness in the right inguinal region, the patient should be simply kept at rest under the influence of a mild anodyne for two or three days, and convalescence will be established. So long, however, as there remains much pain, tenderness or swelling, more decided anodynes internally and emolient applications externally, should be continued.

In addition to the foregoing, in all the more severe cases of perityphlitis, I have seen much benefit result from the prompt application of leeches directly over the seat of the inflammation. In adults from six to twelve leeches may be applied, and allowed to take all the blood they will, and when they fall off, the bleeding from the bites may be continued by the application of warm cloths and emolient poultices, as I have previously indicated. Of course in children and young subjects, the number of leeches will have to be diminished in proportion to the age of the child. In a decided majority of instances, I should say at least three out of four of all the cases that have come under my observation during the last thirty years, the treatment I have now indicated has been followed by the ultimate recovery of the patients. But in those cases where the treatment has been neglected or inefficient during the early stage until it has become evident that suppuration has been established, the earlier an incision can be made with safety so as to give exit to the matter, the more certain will be the recovery of the patient. If you wait until the abscess has become so large as to bring the matter near the surface, making a distinct pointing, with soft fluctuation, it will be at the imminent risk of some of those bad terminations, that I have already pointed out, namely, ulceration into the intestines, into the peritoneum, or into the bladder, causing the patient, sometimes, speedy death, and at others, a lingering sickness and death after many months of suffering. So important is it to open these abscesses early, that some of our most eminent authorities have recommended making incisions in an explorative manner as early as there are any just reasons to suppose the suppurative process had commenced,

and without waiting for any evidences of fluctuation, or the ability to detect matter by the ordinary process of palpation. Drs. Willard Parker, Guerdon Buck and some others, many years since, demonstrated the feasibility in these cases, of making an incision just above and parallel with Poupart's ligament, through the abdominal parietes, as deeply as the fascia covering the muscular structure, and then proceeding in the subsequent steps, to very carefully sever one layer after another as in the cutting over a hernial sac for the relief of strangulated hernia, until they had reached a proper depth for penetrating the abscess, if any existed; or when having made an incision down close to the vicinity, inserting an exploring needle still deeper, for the purpose of determining whether an abscess existed or not, and the precise point of its location. Several cases are recorded where this operative procedure has been followed by the desired relief in the discharge of pus, and the very early restoration of the patient.

LECTURE LIV.

Inflammation of the Intestines Continued—Bilious Colic, its Pathology and Treatment—Colitis and Recto-Colitis or Dysentery; its Causes, Symptoms, Morbid Anatomy, Diagnosis, Prognosis and Treatment.

GENTLEMEN: Before leaving the subject of inflammation and irritation affecting the small intestines, I will direct your attention very briefly to a class of cases that you are liable to meet with at any time in practice, occurring more frequently in persons from five to twenty years of age than at an earlier or later period of life; though they may occur at any period from infancy, even to old age. I refer to cases that in former times were called bilious colic. The patient is usually attacked rather suddenly with a pain in some portion of the abdomen, accompanied by a sense of heat and slight tenderness. The pain is usually of an acute character and distinctly paroxysmal. There is at first little or no fever or general disturbance of the temperature, pulse or respiration, but simply a severe paroxysmal pain accompanied by a continuous sense of heat, and slight tenderness at a particular limited portion of the abdomen, more generally near one or the other of the iliac regions; sometimes directly in the umbilical region or central part of the abdomen. In three cases out of four, however, it is in the region of the right iliac fossa, and ascending colon. But whatever may be the particular seat of the pain, after it has once commenced, there is generally an entire suspension of further evacuations from the bowels. Although I have been in the habit of inquiring very closely, I have rarely found one in which the bowels had been constipated during any preceding part of the time before the attack, but they had either moved at regular intervals daily, or as in some instances had been loose. Very recently a case occurred in which the patient had two or three unusually free evacuations from the bowels only a few hours before the attack. Yet, from the beginning of the pain, there was as usual an entire arrest of further evacuations. If these cases are not interfered with, their natural tendency is to induce in a few hours more or less nausea or rejection of the contents of the stomach by vomiting, after

which the stomach continues to reject whatever is taken in the way of ingesta, including drinks, nourishment, and very frequently medicine, accompanied by a steady increase of the tenderness, with some tumefaction at the place of pain. This swelling is seldom circumscribed, as in perityphlitis, but is more diffused and not accompanied by any well-defined local hardness. The urine becomes scanty and high-colored, sometimes creating a burning sensation while passing, the pulse steadily increases in frequency and diminishes in force, the patient becomes more and more restless until the end of the second or during the third day. If no relief is obtained he is then liable to have cold extremities, a pinched and anxious expression of countenance, great sense of prostration and weakness, sighing in his breathing, like one tired; pulse small and thready; the whole abdomen distended, tympanitic, and more or less tender to pressure; a continuation of the paroxysms of vomiting, the matters ejected being the contents of the stomach, mixed with more or less mucus, either of a grass-green or dark-brown color. A little later it presents the full, coffee-ground appearance, and is thrown up in large quantities by regurgitation, entire prostration ensues, relaxation of the sphincters, and death. There is, of course, much variation in the severity of attacks of this character. Some of them are much milder than I have described, and even without any other treatment than rest and abstinence from food and drinks, and perhaps the use of such domestic remedies as warm cloths, applied over the abdomen, freely, the pain before the end of twenty-four hours subsides spontaneously, evacuations from the bowels occur, and the patient speedily recovers. But there are all gradations in severity, from these simple slight cases up to the severe and dangerous grade that I have already described.

The nature of these cases is often misunderstood. So far as my observations go, a large majority, both of the people and of the practitioners who are called to their aid, receive and act upon the impression that the colic or pains are produced by some irritating substance in the alimentary canal, and that the great desideratum in the treatment is, to cause its removal by obtaining free evacuations from the bowels. And I think I do not err in saying that in four out of five of all the cases to which I have been called in consultation, in the last twenty years, the treatment has been commenced by giving remedies to procure evacuations. It is true that in many of them, anodynes have been administered to allay pain, but at the same time the anodynes have been alternated with doses of physic, the one to allay pain, the other apparently to force an operation from the bowels; and the result has been, without exception, that the administration of the physic so far counteracted the effects of the anodyne, that the pains were continued to a greater or less degree, and within twenty-four hours the irritability of the stomach was developed to such an extent as to reject by vomiting everything further that was administered by the mouth. In some instances, seeing the inadvisability of further administering either physic or anodynes by the mouth on account of their rejection, hypodermic injections of morphine have been resorted to, and in some instances, with the effect of speedily relieving the pains and putting the patient at rest. And had the rest been allowed to remain a sufficient length of time, there is a probability that it would have resulted in permanent relief to the patient, especially if aided at suitable times by large enemas, instead of disturbing the stomach. In the majority of instances, however, still controlled by the idea that some irritative material must be removed by evacuations, the patient has only been allowed to rest for three or four hours under the influence of anodynes, when active

doses of physic were again administered only to be promptly rejected, with a renewal of more distress and persistent vomiting than before, followed by greater prostration of the patient, and an increase of all the abdominal symptoms. I saw a marked illustration of this only a few weeks since, in the case of a youth who had been attacked in the manner I have already indicated. He had three evacuations in the morning before the attack commenced. The pain coming suddenly and with great severity, a physician was called without delay who judiciously administered anodynes at first, sufficient to allay the pain; but with the idea that I have already indicated, he deemed it of paramount importance to freely evacuate the alimentary canal, and consequently commenced giving mild laxatives and alteratives alternated with his anodynes.

The result was a failure to do more than mitigate the pain, and to develop active vomiting before the end of twelve hours. He then ceased to administer medicine by the mouth and resorted to hypodermic injections of morphine, and succeeded in quieting the patient, procuring considerable rest, and so much apparent improvement that there was supposed to be no longer any danger in the case. But as the effects of the anodyne more completely passed away, the pains began to return and with the pains again came the idea that it was necessary to remove the contents of the bowels, consequently two old-fashioned doses of calomel and jalap, ten grains each, were administered for this purpose. They were followed by prompt vomiting, with a rapid increase of the pain, tympanitis and tenderness over the whole abdominal region, with excessive distension, great prostration of the patient, and yet no evacuations that were supposed to pass through the alimentary canal. This led to the conviction on the part of the attending physician that there was probably invagination of the intestine, or intussusception. So strong was this conviction that preparations were made for an effort to obtain relief by causing gaseous distension of the bowels, through the use of enemas, and in case of failure, perhaps, to resort to laparotomy for the purpose of unfolding the supposed invagination. These ulterior measures, however, were not resorted to, and the patient became so rapidly prostrated as to die on the third day after the time of the administration of the calomel and jalap. And yet on careful post-mortem examination, no invagination of the intestines was found, and no positive mechanical obstruction. At two points there were contractions of the circular fibers of the muscular coat, of the intestine, sufficient, perhaps, to diminish the caliber of the intestine at those points more than one half. They appeared to be the only mechanical impediments to the movement of the bowels. Death was plainly the result of intense inflammation, commencing in the muscular and peritoneal coverings of the intestines and extending over the whole peritoneal surface. I regard this class of cases as dependent on primary irritation causing irregular contraction of the circular fibers of the muscular coat of a limited part of the intestine by which the natural peristaltic motion is arrested, and the severe pains induced. Such irritation may result from reflex nervous action or from the direct presence of undigested material in the bowels. Some of these cases I have traced directly to the presence of indigestible material, or other substances that had been swallowed by the patient. In one of the earliest cases that came under my care, the attack appeared to be provoked by a long walk after eating an abundance of pop-corn, some of which was swallowed without chewing. It was in the person of a woman, who had been confined less than two weeks previously, but had gotten up from her confinement well. Having taken the corn as I have mentioned, she walked about a mile and a half carrying her baby,

and before the next morning, was seized with all the symptoms I have described as characterizing the more severe cases of the class under consideration. In this case the symptoms proceeded to an extreme degree; the abdomen became enormously distended from tympanitis. There was tenderness over its whole surface, pulse small, thready, vomiting constant, the matters ejected being first green and later of a brownish hue; extremities cold, and altogether presenting an aspect that had caused her physician to regard the case as hopeless, and the friends were collected to see her die. No evacuations had taken place from the time of the attack of pains, except such fæces as were then in the lower part of the bowels. Being requested to see the patient at this stage of her difficulty, and learning minutely the history of the case, I advised, as a forlorn hope, the administration of an enema consisting of an infusion of tobacco, under the impression that the disease was, what I have already indicated, namely, direct contraction of the circular fibers of a limited portion of the intestine without invagination; and consequently if that contraction could be relaxed, evacuations would occur. Knowing of no more powerful relaxant of general muscular tone or of tonic contraction than tobacco, when its full sedative effects are obtained, I advised its administration in the form of an enema. The amount given was sufficient to cause very decided effects upon the nervous and muscular systems of the patient.

Within twenty minutes she became pale, the surface covered with a sweat, and a feeling as though she was dying. The pulse was very soft and weak and the mind wandering, but this state was followed in the next twenty minutes by a copious evacuation from the bowels, filling the bed with fæces, before the patient could give any warning, and in less than an hour, two additional evacuations followed; greatly lessening the abdominal distension, and under the influence of a little carbonate of ammonia and camphor as restoratives, the stomach became quiet, the pulse improved, and the patient went on to subsequent recovery without the necessity of any other treatment than simple anodynes to restrain the excess of the evacuations during the day following the administration of the tobacco enema. This case to which I have alluded occurred more than thirty years since; and from that time to the present I have regarded these attacks as consisting essentially in a grade of irritation, involving the muscular coat of the intestine primarily and inducing an arrest of peristaltic motion or a contraction of the circular fibers at one or more parts and the development of inflammation only as a secondary consequence. The case which I have just detailed showed in the evacuations an abundance of the identical corn in kernels apparently as whole as when they were swallowed a week previously. But there are many of these cases in which no traces of any foreign substance can be found in the evacuations to explain why they occurred. And some of the patients manifest a peculiar susceptibility to such attacks, having them recur once or twice a year for several years in succession. Entertaining the views I have just explained, in relation to their pathology, I have uniformly adopted the practice of giving such remedies only, at first, as were calculated to produce full relaxation of the muscular fibers and to relieve the pain; and to continue this influence long enough to render it reasonably certain that the irritability of the structures involved had been fully overcome; carefully abstaining from the administration of cathartics of any kind during the first two or three days of the treatment. When the pain and irritability have been fairly checked by the prompt use of anodynes, I have found the administration, first, of large injections of warm water not only to be useful in provoking evacuations, but apparently exerting more or

less soothing influence as indicated by the sense of relief following their use.

After giving two or three enemas of warm water sufficient to invite evacuations, if they fail to produce that effect, and the pains, with more or less abdominal distension, begin to return, then I think there are no remedies more certain to induce the necessary relaxation, and relief from pain, than injections either of the hydrate of chloral and belladonna, or of the infusion of tobacco, as I have already indicated when speaking of other forms of intestinal obstruction. The latter I have had used many times in cases, where, previous to being called in consultation, the attending physician has been led to conclude with much positiveness, that an invagination of the intestines had taken place, and yet with speedy and entire relief to the patient. Consequently, I urge upon you in treating all these cases to divest yourselves of the idea that you must procure by cathartics, early evacuations from the bowels, whether you have reason to suppose the patient has taken some indigestible material or not. And, for the simple reason that if there is indigestible material or some foreign substance in the alimentary canal, it having already induced circular contraction of the intestines, and arrested the peristaltic motion, all efforts to excite further cathartic action will only cause still closer contraction, and speedily induce inversion of intestinal motion, vomiting, and consequently much additional distress and danger to your patient. On the contrary, if you first administer such remedies as will allay pain, dull the morbid sensibility of the part, and induce ultimate relaxation of the walls of the contracted portion of the intestine, then an efficient use of enemas or even of mild laxatives will succeed in procuring all the evacuations that are necessary, and with entire safety to the patient.

On the contrary, nothing is more clear than that if a tube like the intestine is contracted at one point by a band of circular fibers, while above and below, it remains uncontracted, or of the usual size, the more you provoke movements that are calculated to force a passage downward, the more certain you will be to carry the contracted portion into the uncontracted part below, and thereby produce an invagination, which would not have taken place, if your efforts had been directed to the prevention of such motion until the unnatural contraction had ceased. Consequently, whether we view the matter theoretically, or as demonstrated by experience, the rational mode of treatment is first to so far destroy the morbid sensibility and irregular contraction as to remove the resistance to the passage of the contents of the bowels before you insist on efforts to procure such passages. I have thus dwelt upon this class of cases because they are of comparatively frequent occurrence, and because I am satisfied that both the pathological relations I have pointed out, and the indications for treatment, are of much practical value.

Recto-colitis or Dysentery.—Inflammation of the mucous membrane of the large intestine and rectum are met with, of all grades of severity, from the most acute and rapidly progressive to the most chronic or protracted in duration. Inflammation of the membrane lining this part of the alimentary canal very generally extends more or less to the muscular coat. And while it often occupies the whole extent of the colon and rectum, it is more frequently limited to certain portions, or at least is more intensely developed in certain parts, as the cæcum, the right and left angles of the colon, and the sigmoid flexure, than in the transverse portion. It prevails more or less every season, and is then called sporadic, or simply acute dysentery. At some periods of time, and in some localities, it prevails to such an extent, as to present all the characteristics

of an epidemic; and occasionally extends from place to place over an extended district of country in the same manner as other true epidemic diseases. More frequently, however, when it prevails severely, it is limited to particular communities, and is more properly styled endemic, than epidemic. At the present time, writers are inclined to describe two forms of the disease; one, styled simple or catarrhal dysentery, and the other croupous or pseudo-membranous dysentery, sometimes also called diphtheric dysentery. This division, however, is one that can not be maintained clinically at the bed-side; for observation has abundantly shown, that cases of the pseudo-membranous, or diphtheritic form of dysentery, occur frequently interspersed among other cases of a strictly catarrhal character. On the other hand, cases of simple or catarrhal dysentery occur very frequently intermingled with those of a diphtheritic character, especially when the disease is prevailing with more than ordinary severity.

All forms of dysentery, whether sporadic or endemic, prevail most in warm climates, especially within what are called tropical countries, where the summer temperature is long continued; and also more frequently in warm seasons of the year in temperate climates. Indeed, throughout the temperate zone of the earth, dysentery rarely prevails, except during the last months of summer, and the first of autumn. In the northern belt of the United States, its prevalence is limited almost entirely to the months of July, August, September, and sometimes extending through a portion of October. Its highest average prevalence is usually in the month of August. The order in which the intestinal diseases appear in our country, is, usually, first, the serous diarrhœas, cholera morbus, and cholera infantum, connected with and immediately following the climax of summer heat. As we pass this climax, we begin to have the prevalence of dysentery, and a little later, the autumnal fevers make their appearance, showing that there is a relationship in the order of the prevalence of these diseases.

These facts in regard to the climates and seasons most favorable for the prevalence of dysentery, show that there are certain predisposing causes that exert a strong influence over the production of the disease; such as the extreme high temperature of the warm climates or tropical regions; the warm days and cool nights of the last months of summer and early autumn in the temperate regions. To these, which are evidently strong predisposing causes, may be added, also, certain other changes, such as the existence of over-crowding, want of ventilation, as illustrated in the denser populated portions of cities, especially among the inhabitants of tenement houses and manufacturing establishments, where many workmen are congregated in small dwellings, also still more in work-houses and prisons, where sanitary regulations have been overlooked, and in the camps of armies.

Dysentery, in the endemic or epidemic form, appears to be of frequent occurrence in connection with the movements of large armies, in almost all the countries of the tropical and temperate regions of the earth. Few diseases were more destructive to life and health than dysentery in connection with our army during some portions of the war for independence, again with the army that invaded Mexico, and still more in the armies on both sides in the recent civil war. Another influence which seems to predispose to the prevalence of dysentery is malaria, or the active cause of periodical fevers; it having been observed in almost all cases, that dysentery was more prevalent in those decidedly malarious districts than in non-malarious ones, under otherwise similar

conditions of temperature and of season. And it has also been noticed that the seasons of the highest prevalence of malaria itself were usually characterized by an increased prevalence of dysentery. This fact, however, has been noted by many observers, that while malarious fevers were prevalent upon the low lands in malarious districts, dysentery was often observed to be decidedly more prevalent on the neighboring or adjacent elevations and ranges of hills. It would seem that age also exerted some influence as a predisposing cause, from the fact that much the larger proportion of the cases of dysentery are met with in adult life. It is true that cases occur at all periods of life, even from infancy to old age; but a far larger proportion of them are met with between the ages of fifteen and forty, than at an earlier or later period. And, while dysentery undoubtedly prevails most as an endemic disease, recurring with different degrees of severity in different years in malarious districts, and in densely populated towns and cities where the population is subject more or less to the causes which favor the development of typhoid and typhus fevers, it is by no means restricted to those localities. Occasionally it has prevailed, and that, too, in its most malignant form, in hilly, rugged districts of country, which were almost entirely free from malarious influences, and among a rural population as much as among those occupying towns and villages. A few such instances have come under my own observation. I recollect well when the disease prevailed with great severity, destroying many lives through a wide district of the middle and southern portions of New York; embracing the larger parts of the counties of Otsego, Chenango, Courtland, Broome, Tioga and Steuben in a single season during the latter part of summer and autumn; it assumed as malignant a character in the isolated farm houses of well-to-do farmers directly upon the rugged hills, as in any other portion of the district.

In the reports from the various committees upon epidemics, and some of those on practical medicine to be found in different volumes of the "Transactions of the American Medical Association," especially during the first fifteen or twenty years of the history of that organization, are allusions to, and descriptions of many epidemics of dysentery. For practical and clinical purposes I may include the various cases of acute dysentery in three groups: one, that I shall designate as acute sthenic, or active dysentery; another malarious, or periodical; and a third as asthenic, or typhoid. Not that these are different forms of disease in any respect, but simply that the first includes those cases generally of a sporadic character though sometimes epidemic, which occur in otherwise healthy districts of country, and in populations not debilitated or constitutionally influenced by any other general causes. While the second group includes those cases, which are met with oftentimes endemically in distinctively malarious districts of country; and the third group embraces such cases of dysentery whether sporadic or endemic, as occur in the midst of sanitary influences well known to predispose to typhoid conditions of the system. These groups are not different diseases, but simply the same disease; essentially an acute inflammation in a particular portion of the alimentary canal; but occurring under different modifying circumstances:—such as have altered more or less the condition of the blood, the secretions, and the vital properties of the tissues.

Symptoms.—The symptoms of acute, active or sthenic dysentery are usually well marked and easily recognized, as diagnostic of this disease. Some cases commence abruptly with a chill, but in the great majority of cases, the patient feels, from one to three days, a gradually increasing disturbance in the abdomen; consisting of rumbling of gases, increased

peristaltic motion of the bowels, occasionally slight griping pains, and from one to three or four intestinal discharges per day. During this premonitory stage the discharges are fœtid but thinner than natural.

In most instances, at the end of from one to three days of the premonitory disturbances to which I have alluded, the discharges become more frequent, smaller in quantity, and consisting largely of mucus, together with a disposition to strain, called tenesmus, while each discharge is usually preceded and accompanied by much more severe pains across the abdomen, sometimes called tormina. In addition to these frequent paroxysms passing through the abdomen, and the tenesmus and pressure upon the rectum, accompanying the frequent small mucous discharges, there is usually also a dull moderately severe pain in the sacral region of the back, not infrequently some frontal headache, with a great sense of weariness; there is dryness of the mouth, often some thirst, a whitish coat upon the tongue, a slightly reddened appearance of the lips, moderate acceleration of the pulse, and an increase of from one to three degrees of temperature above the normal standard, with a dryer feeling of the skin, and often a slightly flushed appearance of the face. In other words, with the supervention of frequent, painful, scanty mucous discharges, there comes a moderate general febrile action. The urine, also, becomes at this time diminished in quantity, redder than natural, and not infrequently giving rise to some burning and irritation in the urethra when discharged. Usually, within twenty-four hours after the discharges become small and mucous, they become, also, more or less streaked and intermixed with blood, and after the first two or three days the general febrile movement increases moderately in severity, the tongue and lips become more dry, thirst more decided, the pulse is increased in frequency, until it often reaches ninety-five to a hundred beats per minute, the temperature in some instances reaches from 30° to 40° C. (102° to 104° F.), the pains preceding and accompanying the discharges become extremely sharp and severe, while there is almost constant feeling of fullness in the rectum. The patient suffers from distressing tenesmus, often no sooner rising from the vessel and returning to bed than he is again compelled to be up with a vain effort to pass more, when perhaps with all his efforts, the matters passed will be no more than a spoonful of simple jelly-like mucus, intermixed with blood. In the severer class of cases the stomach often becomes irritable, drinks which the patient craves very frequently are rejected by vomiting, and in a small proportion of the cases the vomiting becomes so frequent and urgent as to seriously interfere with the administration of both medicines and nourishment.

In a large majority of cases, however, the stomach remains quiet, and usually the mind free from disturbance or delirium. In cases of ordinary average severity, in about three days the discharges begin to change. The mucus presents more of a whitish or opaque appearance, and the blood is more intimately intermixed with it. The quantity passed each time, also, is larger, while the passages are a little less frequent. With this change in the appearance of the discharges to a more muco-purulent character, the skin becomes less hot, the mouth a little less dry, and if there has been a coat upon the tongue it begins to disappear, especially along the edges, and the patient gets longer intervals of rest, between the paroxysms of pain or griping, either with or without the intestinal discharges. In those cases tending toward a favorable result, the changes I have just mentioned become more and more prominent, until about the fifth or sixth day, when the discharges will begin to lose their mucous, or muco-purulent character, and to present more of

an intermixture of ordinary fæces. The urinary secretion which had previously been very scanty, and often passed with pain, now becomes freer than usual, and is passed with ease. The temperature, also, will be found to have returned nearly to the natural standard and the mouth to have become quite free from dryness. The tenesmus and straining at stool now rapidly diminish and the discharges from this time on grow less and less frequent, until by the end of the week from their beginning, or at the longest, the middle of the second week, there will be no longer anything of a dysenteric character.

Those cases of dysentery, of moderate or average severity, will thus be found to run their course to convalescence, in from seven to nine days; and they will often do this with no medication whatever. This was proven by the clinical observations of Dr. A. Flint, Sr., in 1875, who reported the management of ten cases of acute dysentery of ordinary, average severity, that were allowed to run their course, wholly independent of any medication; under, of course, good regulation of the diet, drinks, and everything of a sanitary character. These ten cases were found to reach a spontaneous termination in convalescence in different periods of time; but the average time of the whole number was from eight to nine days. While it is true that the milder cases of dysentery, whether of sporadic or endemic prevalence, are thus inclined to terminate, within from seven to ten days on an average, spontaneously, it is equally true that the severer class of cases, perhaps occurring at the same seasons, intermingled in the same communities, if left to themselves, will run a much more dangerous course, and yield a large ratio of deaths. When cases of this class are left to their own course, they begin with the same symptoms I have described in all respects, except perhaps developing more suddenly with less prodromic stage, and when developed, exhibiting more urgency in the frequency of the discharge, and a greater degree of tenesmus and more severe griping pains. The pulse at the beginning is more accelerated often ranging from a hundred to a hundred and twenty per minute, the temperature, sometimes even in bad cases, remaining low or only a little above the normal standard, but in others rising on the second or third day to 40° or 40.5° C. (104° or 105° F.) with the skin dry, and a continuation of nausea, depression, dryness of the mouth and lips. The patient feels a great sense of prostration, with much distress at the epigastrium, and generally a troublesome inclination to vomit. These more severe cases present the same succession of changes in the evacuations as I have already described.

But after the first three days, the quantity of muco-purulent material becomes increased, presenting more of a yellowish color, and the blood intermingled with it is of a darker hue; the urine at the same time becoming very scanty, is often almost as painful in its passage as are the dysenteric discharges. The patient suffers all the symptoms of extreme prostration, not infrequently the extremities become cold and bluish, the mind is wandering, the pulse soft, small, almost thready at the wrist, and the respirations are irregular and sometimes sighing. Such cases, if not modified by treatment, are very liable between the fifth and the seventh days to present evacuations of a very thin dark brown or reddish brown color, emitting an offensive or putrid odor, in which if closely examined, may be found shreds and patches of the mucous membrane, sometimes from one to two inches in length. These discharges are not so frequent as at first, but much larger in quantity, and soon become involuntary, or at least partially so. Occasionally it will happen, at this stage, when the discharges have become almost involuntary, and the patient greatly prostrated, that

a larger intermixture of blood will appear; or a true hemorrhage; followed very speedily by complete collapse and death. The most acute and rapidly progressing cases, often of the sthenic variety of the disease, are those reaching a fatal termination between the fifth and seventh days; but the great majority of cases that terminate fatally, do not do so until the middle or latter part of the second week, and in some instances, not until the end of the third week. If they continue beyond this, it is usually in the chronic form, on account of the extensive ulcerations left from the disintegration and sloughing of the mucous membrane; and although they may terminate ultimately, in death, yet where of the chronic form, the duration may be many weeks.

The symptoms of the periodical, or malarious form of dysentery, differ from the group of cases I have just described, chiefly in two particulars; namely: in the mode of beginning, and periodicity. Almost all of this class of cases, after a period of perhaps one or two days of moderate looseness of the bowels or slight diarrhœa, begin the active dysenteric symptoms abruptly by a chill, usually of brief duration, but sufficient to be easily recognized. The chill is immediately followed by a general fever, usually of an active type, and directly associated with all the local phenomena of severe dysentery; such as severe pains in the loins and sacral region, sharp cutting pains through the abdomen, frequent desire to evacuate the bowels, the character of the evacuations being similar to what I have previously described, and the temperature almost always higher than in the other class of cases. Indeed, the dysenteric phenomena, and the general fever in this class of cases, usually present a very active and severe grade, leading the practitioner, if he first comes to the case in the paroxysm, to suppose the patient has a very severe and dangerous attack. But this intense activity in the symptoms usually continues from five to twelve hours, when it begins to decline; and, in a short time all the active phenomena have ceased, the temperature falls nearly to the natural standard, and in many instances a slight moisture appearing upon the surface, the patient falls into a quiet sleep.

This remission in the symptoms continues until the same period of time in the twenty-four hours at which the first chill occurred, when the symptoms of dysentery and fever both reappear,—usually, however, without a marked chill, but the dysenteric symptoms and the general fever both present as much severity as in the first paroxysms, and continue longer before the next remission. We thus have a true periodical or exacerbating type of dysentery. If appropriate treatment is neglected, each returning paroxysm reduces the patient's strength, and usually is more protracted than the previous one, until at the end of five or six days, the remissions are much less distinct than at first, and the dysenteric discharges are continued but not with an equal degree of activity through the whole twenty-four hours. In a majority of the cases the coating upon the tongue becomes dry, and more brown, the abdomen tender to pressure, the pulse soft, compressible and frequent. The urine is scanty. The mind of the patient often wanders during the height of the exacerbation, but is clearer during the rest of the time. The discharges change as in any other case of dysentery from a jelly-like mucus, streaked with blood, to a muco-purulent character, and if not terminated by the end of the first week, almost always become more copious but less frequent, and when reddish brown contain, on close examination, shreds such as were previously mentioned, indicating disintegration and sloughing of portions of the mucous membrane, and not infrequently, are pretty copiously intermixed with dark blood, and yield a decidedly offensive or putrid odor. When such cases are allowed to continue two weeks,

or more, they end in entire prostration, involuntary discharges, collapse and death. In this class of cases, there appears to occur more or less congestion of the liver, and of the spleen, indicated by an increased area of dullness on percussion over the hypochondriac regions, and sometimes by the projection of the edges of the organs below the margins of the ribs. In hot climates inflammation of the interior of the liver is very apt to occur, terminating in suppuration and a hepatic abscess; sometimes there will be only a single abscess, but more frequently a number of them in the hepatic structure. It is comparatively rare that a hepatic abscess forms in connection with dysentery in the temperate climates, yet cases do occasionally occur in this and all other countries. Not less than four or five cases have come under my observation. Three of these, however, took place after the dysenteric disease had assumed a chronic form. The symptoms of the third form of dysentery, or that which I have denominated asthenic or typhoid, differ from both of the others, more particularly in the character of the discharges, and in the grade of continued fever. It is seldom that the symptoms are ushered in by a chill, but most frequently commence with thin diarrhœal discharges, not more than two or three for the first day, but increasing the second, and becoming more decidedly of a dysenteric character, that is, consisting mostly of a bloody serum, instead of mucus, streaked with blood. In these cases the discharges will usually vary in quantity from sixty cubic centimeters to two hundred and sixty (fl. ℥ii to ℥viii). The discharges are accompanied by less acute and distressing pains across the abdomen, considerable tenesmus, although not as acute and severe as in the more active or sthenic grade of the disease. From the beginning the patient has a dull, heavy expression of countenance, often suffused with dark redness, the temperature is then seldom more than 37.7° to 39° C. (100° to 102° F.); the pulse is soft, easily compressed, in some cases much accelerated in frequency, and in others preternaturally slow, with occasional intermittence.

The patients of this class are much less restless and uneasy than those suffering from the acute form of dysentery. The discharges are seldom as frequent, but being larger in quantity, and an intermixture of serum and blood, the latter usually of a dark color, they undergo loss of strength more rapidly than in either of the other forms of the disease. In the most severe cases of this class, such as I met with often during the cholera epidemics from 1849 to 1854, and again in 1866, the discharges of bloody serum were sufficiently copious and frequent to prostrate the patient almost as rapidly as the regular attacks of epidemic cholera. After the first twenty-four hours the discharges were not only considerable in quantity, and largely intermixed with blood of a dark hue, but there were many specks or flakes of a whitish color floating in the bloody serum, giving to the whole mass much the appearance, in some instances, of the water in which bloody pieces of lean meat had been washed. Some of these cases, if not promptly influenced by judicious treatment, failed so rapidly as to cause entire prostration, involuntary intestinal discharges, suppression of urine, cold extremities, dull, drowsy condition of mind, and finally entire collapse and death at the end of the third, or during the fourth day. The larger number of fatal cases, however, terminated between the fifth and seventh days. This is a much more fatal form of dysentery than either of the other varieties. Still it varies greatly in its severity in different seasons and in different localities, much depending upon the previous tone and health of the individuals attacked, and still more upon the sanitary surroundings in which they are placed. The first time I met this form

of dysentery was in 1849, during the severe epidemic of cholera that prevailed in this country in the summer of that year. I was then a resident of New York city. The cases began to occur about the time the epidemic of cholera reached its climax; became more frequent as the epidemic declined, and the attacks of dysentery continued to recur for some three or four weeks after those of cholera had ceased.

Moving from New York to Chicago in the latter part of that season, I met with moderate epidemics of cholera, in the latter city, during the summers of 1850, '51, '52, and a very severe epidemic in '54. Again, a moderate epidemic prevailed in this city as well as in other parts of the country in 1866. In all these seasons, I saw cases of this typhoid or asthenic type of dysentery, more strongly marked than I have seen at any other periods of time. Yet but few seasons have passed during the whole of my residence in this city that I have not met with some cases of dysentery that presented the characteristics of this particular grade. In most of the seasons they have been limited to patients who were occupying badly ventilated rooms, or exposed to atmospheres contaminated by accumulations of animal and vegetable matters undergoing decomposition, as in unclean alleys, in rear houses, or in places in which they were using water more or less contaminated with organic matter derived from percolation through the surface soil. In connection with armies, dysentery is not infrequently found to prevail under circumstances in which another element is exerting an influence: namely, scorbutus or scurvy. During the civil war in this country, there were some instances in which portions of the army were subject to a decidedly scorbutic influence, at the same time they were occupying a malarious region and also surrounded by more or less of the causes that produce typhoid fever. It may be said that the causes of typhoid fever, malarious fever, and scorbutus were acting coincidently. Under such circumstances, the occurrence of dysentery proved to be one of the most intractable forms of acute disease that the members of the medical staff had to encounter. Of all those who were invalided and sent to the North for more favorable conditions of recovery, none were found more difficult of management and restoration to health, than the cases of chronic dysentery that had originated under the combination of influences I have just mentioned. All the forms of dysentery I have described are liable either to terminate spontaneously in recovery in from one to three weeks, or to proceed to a fatal termination within the same limits of time, or to become moderated in severity, and continue in a chronic form for an indefinite period. Cases of dysentery are met with among children particularly, every summer, which follow attacks of cholera morbus and serous diarrhœa. Although secondary to the choleraic attack, yet after having assumed the characteristics of dysentery, their tendency and general progress are similar to those I have already described.

Anatomical Changes.—The appearance of the mucous membrane affected with dysenteric inflammation varies much in different cases, more particularly on account of the differences in the intensity of the inflammatory process. In all cases in the first stage, the membrane is intensely injected with blood, giving it various shades of redness, from a bright red color to a dark brown, and when it has proceeded to a fatal termination, usually causing decided softening and impairment of the texture. In those cases which have been denominated simple or catarrhal inflammation, the parts of the membrane affected most are the folds and parts containing the glandular structures. In addition to the various shades of deep redness, the membrane is tumefied or swollen, altered in various

degrees in its texture, perhaps always, in acute cases, in the direction of softening; the submucous tissue much infiltrated with liquor sanguinis, containing plenty of leucocytes or white corpuscles, and in some instances small points of red corpuscles, or slight extravasations of blood. In some instances these changes also exist in the muscular coat, but in a less degree. The mucous membrane itself contains numerous lymphoid cells, pus corpuscles and fibrinous exudate, not only filling the interstitial spaces of the membrane, but obstructing the tubules and follicles in some places to such an extent as to cause necrosis and sloughing of the superficial layers of the structure; thus giving to the more intensely inflamed portions of the membrane the appearance of irregular and more or less extensive ulcerations. In the grade of inflammation which has been called diphtheritic, the disease invades the tissue more deeply, and instead of being limited largely to the prominent folds of the mucous membrane, it permeates as extensively the base of these folds or the whole membrane continuously, and causes a greater degree of tumefaction on account of the more copious infiltration into the submucous tissue, and in some instances into the muscular coat, and leads to a larger amount of fibrinous exudation into the interstitial spaces, both of the submucous tissue and of the mucous membrane proper. Under the microscope, you have the appearance of lymphoid cells, or white corpuscles and pus globules interspersed with more or less of fibrillated fibrin. These substances fill up more or less closely the interstitial spaces, and in some places crowd upon the tubules, and block the vessels so much as to cause more extensive necrosis and sloughing of the mucous membrane than in the catarrhal cases, and leave deep, irregular ulcerations on a large part of the surface.

Not infrequently in those portions of the membrane where the changes of structure have been greatest, the inflammatory process extends through to the peritoneal coat, causing its outer surface to be injected with blood, sometimes covered with fibrinous exudation, by which adhesions are formed between coils of the intestine. Cases have occurred in which the ulcers have extended through the peritoneum, permitting more or less of the contents of the intestine to escape, and yet the coincident fibrinous adhesions prevent the diffusion of the matter into the general cavity of the peritoneum and lead to a circumscribed abscess. In other instances the adhesions not limiting the diffusion of the fæcal matter, general peritonitis, speedy collapse, and death has followed. While in nearly all cases of acute and subacute inflammation of the colon and rectum whether of the catarrhal, croupous or diptheritic grade, the membrane undergoes softening disintegration, or sloughing and ulceration to a greater or less degree, in the chronic form of the disease, the submucous tissue becomes infiltrated with more plastic material and the mucous membrane itself becomes more or less indurated and thickened, while its appearance is rendered very unequal and ragged with ulcerations varying from the most superficial to those penetrating deeply into the tissues. Some cases of the acute form of dysentery have occurred, in which in limited portions of the intestines more especially in the sigmoid flexure and upper portion of the rectum, deep and extensive ulcers have formed from the sloughing of the tissues, and yet convalescence has followed, and these deep and large ulcers have ultimately been repaired by granulation and cicatrization. But the cicatrices, and cicatricial tissue here, as in most other structures of the body contract after the cicatrices have been completed; and in doing so, they have caused permanent alterations in the caliber of the intestine, by projecting like bands across portions of its diameter, and

sometimes to so great an extent as to constitute strictures that seriously obstruct the passages of the bowels. Such cases, although the patients recover for a time, are extremely liable to be followed, sooner or later, by the setting up of chronic inflammation above these strictured portions, where the fæces are kept lodged an undue length of time, and always to give much annoyance in the procurement of regular evacuations. I have a patient now under observation, seriously annoyed by a stricture diminishing the caliber of the intestine more than one half, situated just at the lower portion of the sigmoid flexure, which resulted from a severe attack of acute dysentery some fifteen years since. The only way by which she can be rendered comfortable is to secure just that degree of relaxation of the bowels, by which the fæces are rendered semi-fluid.

Diagnosis.—The symptoms which I have described as characterizing the different stages in the progress of acute and subacute dysentery are so characteristic in their nature as to render the diagnosis of the disease comparatively easy. From inflammation of the membrane lining the small intestines, it is distinguished by the greater amount of pain, especially tenesmus, and the more decidedly mucous discharges, almost always more or less intermixed with blood. The only two other conditions which might possibly be mistaken for dysentery, are habitual constipation in which the sigmoid flexure and portion of the rectum have been allowed to become filled with hardened fæces, causing local irritation in the rectum. These cases are to be differentiated from true dysentery, first by carefully inquiring as to the preceding condition of the patient; which would develop the fact that the bowels had been not only habitually costive, but probably that there had been no fæcal evacuations for several days before the irritation in the rectum was manifest; and secondly, by direct examination of the rectum, which would disclose the fact that it was filled with impacted, or hardened fæces. The other morbid condition which may simulate in some respects dysenteric symptoms is the presence of inflamed hemorrhoids, or piles. Dilatation and sacculation of the hemorrhoidal veins constituting one form of hemorrhoids, not infrequently are accompanied by sufficient inflammatory action, more especially when some of the more dilated vessels get strangulated by being retained in the sphincter, after a passage of the bowels, to give rise to much of the same kind of feeling or desire to frequently evacuate the bowels, with sense of fullness or pressure in the rectum as exists in dysentery. But such cases are seldom accompanied by any discharge of mucus, neither will there usually be any general febrile symptoms or disturbance of the appetite and secretions. But a more immediate means of differentiating this class of cases will be in the direct examination of the rectum, thereby ascertaining the existence of the hemorrhoidal tumors.

Prognosis.—The prognosis, in acute and subacute dysentery, will vary much from the great differences in the severity of the disease in different seasons, and especially in the different periods of its epidemic prevalence. A very large proportion of all the cases of sporadic dysentery have a tendency to recovery, and consequently the prognosis is generally favorable. In much the larger proportion of cases, in those seasons when it may be said to have an endemic or even an epidemic prevalence, the inflammation causes so much destruction of the mucous membrane as to prevent recovery. Such cases will usually reach a fatal termination in from one to two weeks. There are some seasons in which dysentery prevails in so malignant a form, that more than one half of all the cases terminate fatally; but such epidemics are rare. Within my own experience I have met with no season of its prevalence in which the mortality

exceeded one in ten or twelve of the whole number coming under observation. And, with the exception of two or three seasons of unusually severe prevalence, the mortality has not reached one in twenty-five or thirty cases. Such as have terminated fatally have usually been of the class I have denominated typhoid, occurring among those who are subjected to unfavorable sanitary influences, and who generally neglect to secure proper medical attendance until the disease has made considerable advancement.

Treatment.—Much diversity of opinion seems to exist, even at the present day, among writers of eminence, in regard to the best mode of treatment in acute and subacute attacks of dysentery. Many claim that the treatment should be almost invariably commenced by the administration of saline cathartics, sufficient to cause free evacuations from the bowels; others recommend oleaginous cathartics, as castor oil. The advantages claimed for the administration of either saline or oleaginous laxatives, especially the first in the commencement of dysenteric inflammation, are, first, to remove supposed retained fæces, or other irritating matters in the alimentary canal, and second, to deplete the congested vessels by the increased effusion caused by the operation of the saline class of cathartics. Even those writers who readily assent to the fact that nineteen-twentieths of all the cases of dysentery begin with diarrhœa, and thereby show conclusively that the alimentary canal contains no hard fæces, or accumulations of any kind other than the ordinary secretions, nevertheless assent to the general direction to commence treatment by a saline laxative, for the purpose of making sure that the contents of the bowels have been properly evacuated.

Another, perhaps smaller class of writers, advocate with the most decided confidence the commencement of treatment by the administration of large doses of ipecac; claiming that the administration of from one to three grams (gr. xv to xlv) of ipecac in a single dose in the early stage of the disease, and the same repeated twice in the twenty-four hours, will produce the most decided amelioration in the condition of the patient, and modify favorably the subsequent progress of the disease. It is conceded, that in most cases, the first dose will produce free, often copious vomiting; but it is claimed that the subsequent doses will be retained, and from one to three such doses retained will be sufficient to cause free fæcal evacuations from the bowels, apparently containing a liberal quantity of the coloring matter of bile, with little or no pain at the time of the evacuation. These bilious stools are sufficiently characteristic to receive the designation of ipecac stools; and in some instances they have appeared to be followed by a rapid subsidence of all the phenomena of inflammation, and an early recovery of the patient. In hot climates where dysentery is more severe and more liable to proceed to an early fatal termination, and at its outset involves a higher grade of inflammatory action, there are not wanting those who regard a free venesection at the commencement of the disease, as of much value in moderating its further progress. My own experience in regard to the use of large doses of ipecac has not been uniformly favorable. On the contrary, in a majority of the cases in which I have exhibited it, the patients have not only been vomited freely by the first dose but equally so by the second and even by the third. And, in two or three instances, the stomach remained so irritable, as to reject subsequently almost everything, in the way of either medicine, drink, or nourishment, and apparently was the cause of an early and undue degree of prostration. In some other cases, after the first dose, the medicine was retained, and in from twelve to eighteen hours, free char-

acteristic evacuations from the bowels followed, with much relief to the sensations of the patient, but the relief was not permanent. In from six to twelve hours the intestinal discharges began again to recur, and gradually assumed more and more of the characteristic mucous and bloody appearance; and in twenty-four hours more, all the symptoms of the dysenteric disease were re-established, almost as actively as before the administration of the remedy. On the other hand, in a few cases, the ipecac treatment has been followed by the most satisfactory results. In one case of a very acute and severe character, in which twenty-four hours had passed before I saw the patient, the symptoms indicated a case of the utmost gravity. I directed thirteen decigrams (gr. xx) of ipecac to be mixed with a little syrup and taken at once, and the same to be repeated in six hours. At my next visit I found that both doses had been retained, no vomiting had occurred, and the tenesmus and frequent desire for evacuation had almost entirely ceased. I then ordered smaller doses to be continued every four hours, and during the next twelve hours three or four copious yellowish brown fæcal evacuations occurred, after which there was no return of the dysenteric discharges, and the patient reached a very early convalescence. Another was a case of dysentery following confinement, sometimes called puerperal dysentery. In this instance the stomach was excessively irritable, and would neither retain ipecac nor any other medicine. On account of this extreme irritability of the stomach, I caused ipecac, combined with a few drops of the tincture of opium to be administered per rectum. Three grams (gr. xlv) of ipecac, and two cubic centimeters (min. xxx) of the tincture of opium in one hundred cubic centimeters (fl. ℥iii) of milk-warm water, were administered as an enema, the parts being supported for a few minutes after the withdrawal of the syringe, and the whole was retained, producing entire relief from suffering and causing the patient in one hour to fall into a comfortable sleep. In about three hours, what was left of this enema passed off, and was soon followed by moderate tenesmus, and some cutting pains across the abdomen. Another enema of the same material was immediately used. This was followed by the same entire relief, which was of longer duration than after the first. After this no symptoms of returning dysenteric irritation occurred for twelve hours. Then another enema, containing only half the quantity of ipecac and tincture of opium was administered. I have no doubt but there are cases, if we could discriminate them properly, in which the administration of ipecac in the beginning of the disease—and the earlier it is done the better—would be followed by a speedy and entire arrest of all the symptoms. But my own experience has led me to believe that a large majority of the cases, as we meet with them in ordinary general practice, can not be treated as successfully in this way as by other means. The distressing vomiting that often follows the first administration of the ipecac, is not compensated for by any degree of permanency in the relief obtained; and unless the temporary relief is followed up by other medicines calculated to secure a continuance of the result, in nearly all the cases the effects of the remedy will be temporary in their duration.

And my observation has shown, that the same remedies, which are necessary to secure and perpetuate the beneficial results of the ipecac, will in most cases quite as efficiently secure all those results, if administered without the ipecac. In regard to the administration of cathartics of any kind, saline or otherwise as the initial step in the treatment of acute dysentery, I have become satisfied by a very long and abundant experience,

that the rule given by most writers is altogether too broad: and leads to the use of evacuant remedies not only when unnecessary but often when decidedly injurious to the patients. It must be remembered, that a large majority of the cases commence with diarrhœa, and that there is no evidence whatever of the retention in the bowels of a single ball of hardened fæces, nor any other morbid material, except the products of the inflammation itself. Simply removing these products, without modifying the inflammation, is merely a work of supererogation, as the patient's own efforts at stool, every ten, twenty, or thirty minutes, evacuate them quite as fast as they are formed. My rule has been, when called to a case of dysentery, uniformly to make a careful inquiry as to the character and extent of the fæcal evacuations at the commencement, and for one or two days prior to the beginning of the disease. Whenever it appears from such inquiry that there may be retained fæces, either in the middle of the intestinal canal or in any part of the colon, and especially if on making careful examination by palpation over the abdomen there is any indication of fullness, that is not gaseous but fæcal in any part of the course of the colon, I do not hesitate to commence treatment with a sufficient amount of saline laxatives to cause one, two, and sometimes three free evacuations from the bowels. But as I have intimated, these inquiries result in at least forty-nine cases out of every fifty, in furnishing full and satisfactory evidence, that there are no retained, or accumulated fæces in any part of the alimentary canal. Consequently in all such cases I proceed directly to the administration of such remedies as will most certainly allay pain and diminish the extreme morbid excitability of the inflamed structures, until the intestines are put entirely at rest. I usually combine the anodyne, which is required for this purpose, with such alteratives as will be likely to moderately excite the various natural secretions of the system; more especially those of the kidneys, skin, and other important glandular structures. If it be within the first twenty-four hours after the commencement of the attack, and the skin is dry, the temperature somewhat elevated, the desire for evacuations frequent, the urine scanty, I have generally prescribed a powder composed of pulverized opium one decigram (gr. iss) nitrate of potassium three decigrams (gr. v) and mild chloride of mercury six centigrams (gr. i), to be taken every two hours until the pains and tenesmus are relieved, and the patient inclined to sleep.

In those instances which are occasionally met with, in which the general febrile action is more active, giving a temperature of 39° or 40° C. (103° or 104.5° F.), with a coating upon the tongue, and much thirst, I have given between these powders a mixture of nitrous ether and camphorated tincture of opium each forty-five cubic centimeters, (fl. ℥iss) and tincture of veratrum viride four cubic centimeters (fl. ʒi), in doses of four cubic centimeters (fl. ʒi) diluted with a little water. Under these influences the patient usually begins to feel some degree of relief within the first six or eight hours, which is gradually increased with each renewed administration of the medicines, until before the end of the first twenty-four hours, there will be an entire suspension of all the more severe symptoms, some moisture upon the skin, and the patient will be inclined to sleep. When this is the case I leave out the mild chloride of mercury from the powders, and extend the interval between the time of their administration to four hours instead of two, and continue the liquid prescription as before, between the doses of the powders, and in this way allow an interval of twelve or eighteen hours to elapse. If during that time the bowels have remained quiet, without further discharges, I suspend the

use of the powders altogether, and give an enema of warm water to be administered in sufficient quantity to fill up the rectum well, for the purpose of provoking moderate evacuations from the bowels. In the great majority of instances this will be followed within half an hour by an evacuation, that is semi-fluid, fæcal, and usually tinged a yellow or greenish color, such as is popularly called a bilious stool. In almost all instances this will be followed in one or two hours by another evacuation of a similar character. This will be accompanied by a sense of relief to the patient, and if the administration of medicine is now allowed to remain suspended, in most instances another discharge will follow in less than an hour, containing a little mucus, and accompanied by slight griping pains across the bowels. If not interfered with the passages will continue to increase in frequency, and by the end of twenty-four hours from the time of procuring the first stools the patient will be suffering from a return of all the dysenteric symptoms, but a little less severe than at first.

This result, however, can be prevented usually, and should be, by carefully providing the patient with some anodyne medicine to be taken immediately after the second evacuation from the bowels. One of the best medicines for this purpose is a combination of the aromatic sulphuric acid, sulphate of magnesia, and tincture of opium mixed with water in the proportion of four cubic centimeters (fl. ʒi) of each of these ingredients to thirty cubic centimeters (fl. ʒi) of water; of which four cubic centimeters (fl. ʒi) should be administered, diluted with sweetened water, immediately after the second fæcal evacuation of the bowels. The same may be repeated after every evacuation until the bowels have again become entirely quiet. In a great majority of instances, two or three doses will so far control further evacuations, that the patient will be very comfortable, and the discharges will not occur oftener than once in from three to four hours. And in three or four days they will have assumed an entirely healthy fæcal character, and there will not be more than one or two in the day; in other words, the patient will have reached the commencement of convalescence. It is seldom that the veratrum viride, which was placed with the nitrous ether and camphorated tincture of opium in the liquid prescription is needed more than the first forty-eight hours. While in a large majority of the cases of ordinary sporadic dysentery, the remedies which I have thus far indicated, when they are used as recommended, will be sufficient to guide the patient to an early convalescence, you will meet with many cases, especially in seasons when the disease is prevailing in the more severe or endemic form, in which the inflammatory action will be more persistent. In such cases the discharges soon assume a more distinctly muco-purulent character, mixed with blood, and accompanied by some tenesmus and the continuance of a low grade of febrile action.

Under such circumstances I have found no remedy equal in value to the emulsion, containing oil of turpentine, oil of wintergreen and tincture of opium rubbed together thoroughly with gum arabic, sugar and water, the formula for which I have given you when speaking of the treatment of the advanced stage of typhoid fever, and more recently in the same condition of inflammation in the mucous membrane of the ileum (see p. 539) Four cubic centimeters (fl. ʒi) of this emulsion given every two, three or four hours to an adult according to the frequency of the evacuations, will, in a large majority of even the more severe cases, produce a very speedy and decidedly beneficial effect by steadily lessening the frequency of the discharges, diminishing the amount of blood in them, and generally causing their entire arrest in from three to four days. The doses should be given frequently at first, and the interval lengthened in proportion as

the discharges diminish, thereby limiting the latter to one or two in the twenty-four hours, until they become natural in quality, rather than entirely suppressed. If the discharge of urine is painful, as is often the case in this disease, it may be much lessened by giving between each of the doses of the emulsion four cubic centimeters (fl. ʒi) of an equal mixture of the liquor ammonii acetatis and nitrous ether. If the pulse is decidedly weak, fifteen minims of the tincture of digitalis may be added to each dose of the liquor ammonii acetatis mixture with much benefit. In children and sometimes in adults, I have found that the emulsion containing turpentine proved more or less offensive to the stomach, and after taking a few doses was rejected by vomiting. In other instances when it has not been rejected, after its continuance at frequent intervals for three or four days, it has added to the irritation of the neck of the bladder, and induced symptoms of strangury. When either of these circumstances occur it should be discontinued, and in its place I give a gelatine capsule containing carbolic acid, pulverized ipecac and pulverized opium, in such proportions that each capsule will contain sixteen milligrams (gr. ¼) of the carbolic acid, twelve centigrams (gr. ii) of the ipecac, and six centigrams (gr. i) of the opium. A pill or capsule containing these ingredients may be given to an adult every two, three or four hours until the discharges are arrested, and then given at intervals sufficient to hold them in check until the inflammatory action has subsided, and the discharges returned to a more natural character. In children, the ordinary carbolic acid mixture may be given (see formula p. 138) in doses, to a child five years of age for instance, of twenty or thirty minims every three or four hours, and instead of having any tendency to nauseate the stomach, it allays nausea when it already exists, and seldom fails to improve the discharges, both in their frequency and their quality. If, under the influence of these or any other remedies which may be administered, the dysenteric disease manifests a tendency to continue and assume a chronic form, one of the best remedies that can be found is the nitrate of silver in combination with pulverized opium and extract of hyoscyamus in the form of a pill; in the proportion of two centigrams (gr. ⅓) of the nitrate of silver, and six centigrams (gr. i) each, of the extract of hyoscyamus and pulverized opium, in each pill. As the activity of the symptoms has already abated, and the disease assumed a more chronic form, it will be sufficient to give one of these pills once in from four to six hours.

If, when given at these intervals, they do not exert the necessary restraining influence over the frequency of the discharges, they may be aided by giving moderately full doses of the turpentine and laudanum emulsion previously alluded to, each night and morning. You will notice that I have omitted from the list of remedies recommended for the management of acute and subacute dysentery all the more active class of ordinary astringents, such as gallic acid, representing the various vegetable astringents, and acetate of lead, sulphate of aluminium, etc., representing the mineral astringents. I have done this purposely, because my own clinical experience has satisfied me that they can seldom be used in these forms of the disease without checking other secretions, at the same time that they temporarily lessen the exudations from the mucous membrane of the colon and rectum; and consequently that their effects as a whole are not beneficial to the patient. In giving the clinical history of dysentery, I mentioned a class of cases liable to occur in malarious districts, that are modified in their progress by the coincident action of malaria upon the system, especially at seasons

of the year when that agent is mainly exerting an influence upon the community. The only decided difference, however, in the management of that class of cases, from the ordinary active form of dysentery, consists in the early and efficient administration of quinine, or some other reliable antiperiodic, in addition to the ordinary remedies addressed to the local inflammatory disease. The best antiperiodic for this purpose is undoubtedly the sulphate of quinine, and the most favorable time for its administration is at that part of the twenty-four hours corresponding with the remission in the febrile paroxysms. And during such remission it is desirable to administer the quinine in such doses, that from twelve to twenty grains shall be given during each of the first two or three days. Subsequently it is seldom necessary to give more than from six to eight grains in the twenty-four hours until convalescence is established. By simply supplementing the ordinary treatment, as I have given in detail, with the use of quinine, or any efficient substitute of an antiperiodic nature, you will be able to control nearly all the cases of dysentery in malarious districts that come under supervision at an early period of their progress.

A third variety of dysentery, or distinct class of cases, was described as occurring under circumstances and sanitary influences such as favor the development of typhoid conditions of the system and giving to the dysentery a distinctly asthenic grade of action, from the beginning. In these cases, as I have already stated, the discharges are more of a bloody serum in the early stage, than a jelly-like mucus. The pulse is softer, weaker from the beginning, and the whole aspect of the patient is that of a depressed and typhoid condition. Some of these cases tend very rapidly to extreme exhaustion and early collapse. Consequently they require to be met promptly with appropriate remedies. This is particularly the case during the seasons when the disease assumes an epidemic character.

When called to this class of patients, if I find the discharges quite large in quantity, decidedly serous, tinged with dark blood and recurring as often as every half hour, with a soft compressible pulse, dingy and depressed appearance of the countenance I usually commence treatment by giving a powder consisting of acetate of lead thirteen centigrams (gr. ii), pulverized opium six centigrams (gr. i.) and calomel three centigrams (gr. $\frac{1}{2}$), every four hours, and four cubic centimeters of the same solution of aromatic sulphuric acid, sulphate of magnesia, and tincture of opium that I have previously mentioned, half way between the powders; causing them to alternate two hours apart—sometimes only an hour and a half apart. At the same time I direct an enema to be given immediately after every evacuation from the bowels, containing six decigrams (gr. x) of acetate of lead and three centigrams (gr. $\frac{1}{2}$) acetate of morphia, dissolved in two ounces of cold water. I mean literally that I give this enema *immediately* after each evacuation from the bowels.

If the patient is allowed to wait ten or fifteen minutes after an evacuation, before the enema is administered, time enough will have elapsed to have caused more or less accumulation of the bloody serum in the rectum, together with the ability of the muscular coat of the intestine again to take on peristaltic or expulsive action, and the enema, if then given will be promptly forced back. But if the materials are ready, and the enema is administered as soon as the patient has finished his evacuation, and returned to a recumbent position, and as the pipe of the syringe is withdrawn, the anus is supported for a few minutes, by pressing the nates together or supporting it with a napkin, it will very frequently be retained long enough to exert a very important influence, in aiding to

suppress this class of discharges. I have known some very severe cases of this disease to be controlled, by the combined influence of medicines given by the mouth and rectum, so promptly that the patients were placed at the end of the first twenty-four hours in a comparatively safe condition. If these means succeed in actually arresting the discharges, it is desirable that the doses be simply given at longer intervals, so as to maintain the effect until the bowels have remained quiet for at least twenty-four hours. If no evacuations occur during that period of time, all remedies containing anodynes may be suspended, and the patient allowed to take small quantities of properly prepared wheat flour and milk gruel at intervals of half an hour or an hour, with perhaps a tablespoonful of strong tea or coffee, either with or after the doses of the gruel, until eighteen hours more have passed, during which in a very large proportion of the cases, evacuations will have returned. Not as at first, however, but more of a semi-fluid, or fæcal character, though sometimes a little tinged with blood; and the first one or two unaccompanied by pain. If such evacuations occur spontaneously, immediately after the second movement of the bowels, the solution of aromatic sulphuric acid, sulphate of magnesia and tincture of opium should be resumed, and the doses should be repeated now after every evacuation; or if no further evacuations occur, once in about four hours, for two or three days. If the urinary secretion has been scanty, it will be profitable to give the patient between the doses of the last named medicine, either a teaspoonful of the nitrous ether diluted with water, or an equal quantity of the nitrous ether and liquor ammonii acetatis. If the pulse be quite weak and soft, it will be proper to add from ten to fifteen minims of the tincture of digitalis, to each of the doses of the diuretic. I have seen many of the cases, of what are termed typhoid dysentery, as promptly arrested by this method of treatment as the ordinary cases are, by the treatment recommended for them.

But when cases are not brought under treatment until the disease has progressed one or two days, or if the remedies as used, fail to control the progress of the discharges, and the patient becomes more decidedly exhausted, as indicated by a very soft, weak pulse, cold and leaden hue of the extremities, sunken eyes, torpid or wandering condition of the mind, partial loss of control over the sphincters, so that the bed is frequently soiled before the patient can give warning of the desire to evacuate the bowels, I have found no remedy or combination of remedies, that has been equally valuable with that of strychnia, nitric acid, and tincture of opium; a convenient formula consisting of strychnia, six centigrams (gr. i), nitric acid, four cubic centimeters (fl. ʒi), tincture of opium fifteen cubic centimeters (fl. ʒiv) simple syrup and water a hundred and twenty cubic centimeters (ℨiv). Of this, four cubic centimeters (fl. ʒi) diluted with additional water, may be given at first every two hours. And at the same time injections may be given either of the acetate of lead and morphia, as previously recommended, or gallic acid and tincture of opium, and repeated under the same regulations as mentioned before. In addition to the medicines, these cases should also be sustained by giving at least twice between each of the doses of the strychnia solution one or two tablespoonfuls of the flour and milk gruel, with equal quantities of the tea or coffee, or their active principles, caffeine or theine. Where it can be had, the caffeine is perhaps preferable to either an infusion of coffee or tea. But an ordinary strong cup of coffee with a little milk and sugar will usually answer a good purpose by being taken with the gruel, thus furnishing small quantities of nourishment in the most convenient

condition for absorption, while the tea or coffee shall act as a true nerve excitant. You thereby counteract the tendency to stupor and drowsiness, and thus maintain or assist in maintaining the general functions of nutrition and innervation. The strychnia also is given with a view of exerting a prompt and strong influence in sustaining the sensibility and action of the nervous centers; for it is through failure of these, and the consequent failure of the capillary circulation, accompanied by general suppression of secretions, with relaxation of the sphincters, that the patient is hastened directly into collapse and death. I have derived the most satisfactory results from the use of the combination of strychnia, mineral acids and opium, in the treatment of this class of cases; and have seen many recoveries from conditions that were supposed to be hopeless.

Of course as the discharges become less frequent and copious, and less bloody under the influence of the enemas and the strychnia and opiate solutions combined, the frequency of the doses of the latter should be diminished, but only in proportion as the discharges become less frequent, aiming always to limit them to one or two in the twenty-four hours until they become natural. I have seen nothing but disastrous results from the use of cathartics in this class of cases of dysentery. In a few instances I have derived very decided advantage from the use, in the first stage, of pretty full doses of ipecac and morphine in the form of enema; thirteen decigrams (gr. xx) of the ipecac and three centigrams (gr. $\frac{1}{2}$) morphine in sixty cubic centimeters (℥ii) of water, may be passed into the rectum immediately after each evacuation until the latter ceases to recur. If from any cause, cases of an asthenic or typhoid type of dysentery are only partially controlled during the active stage of the disease, and manifest a tendency to assume the chronic form after the general fever has subsided, and the discharges continue at the rate of from three to six in the twenty-four hours, being less of the bloody serous character, but containing more evidence of a muco-purulent material, they will generally be found to diminish steadily until convalescence is established, by giving them the ordinary turpentine and laudanum emulsion, alternated with the strychnia and nitric acid solution; each prescription may be given once in six hours, making them alternate three hours apart. Particular attention throughout all stages of this variety of dysentery should be given to the support of the patient by judicious nourishment.

Chronic Dysentery.—When inflammation of the mucous membrane of the colon and rectum has assumed a decided chronic form, whether as the sequel of an acute attack, or as a primary disease, there is usually no general febrile action, or increased heat, little or no tendency to coating upon the tongue, or much dryness in the mouth, and but little interference with secretions, either from the skin or kidneys. But the patient is troubled with paroxysms of griping and commotion in the bowels, followed by tenesmus of a moderate character, and either muco-purulent or sero-purulent discharges, varying in frequency from two to six or more in the twenty-four hours; not infrequently the patient being able to be up and dressed, and sometimes going out almost every day. The evacuations in such cases are almost always more numerous and urgent, on the patient's first rising from the bed in the morning, or the tendency is manifested for one or two evacuations, soon after taking food at each meal-time. Sometimes the amount evacuated each time is considerable, consisting of thin reddish brown, slightly fæcal material, more or less offensive in its odor, and at other times persistently maintaining the character of small muco-purulent discharges, streaked here and there with blood. Examination under the microscope will, in almost all these cases, detect

an abundance of pus, detached epithelium, not infrequently shreds of necrosed or detached portions of the mucous membrane. The patient pretty steadily emaciates and loses strength, until after many months, and sometimes two or three years of suffering, he reaches the stage of fatal exhaustion. The final failure is preceded in many instances by more or less œdema of the extremities, apthous ulcerations of the mouth and fauces, scanty, and sometimes albuminous urine, and occasionally, though rarely in our climate, the supervention of suppurative inflammation in the liver, giving rise to hepatic abscesses. The anatomical changes which are found in cases of chronic dysentery, may be found copiously and admirably illustrated in one of the volumes giving the medical history of the late civil war. Indeed, I would refer you to these volumes, in which there is a large amount of very valuable matter pertaining especially to the anatomical changes, and the great variety of results that are liable to occur in the progress, not only of the different grades of dysentery, but of all the inflammatory affections of the alimentary canal, particularly as they are modified by camp life in connection with armies, and an exposure both of the causes of periodical fevers on the one hand, and of typhoid fevers and scorbutus upon the other.

The most important anatomical changes are the thickening and induration of the folds of the mucous membrane in whatever part of the colon or rectum the disease has existed; these folds being in many cases so thickened from the infiltration and induration of the sub-mucous connective tissue as to give them the appearance of ridges, and sometimes of polypoid projections into the caliber of the intestine.

The epithelial layer of the membrane, over much of the inflamed surface, is either removed or much disturbed. In some places the whole depth of the mucous membrane is destroyed by necrosis or sloughing, leaving ulcerations of considerable extent, with irregular edges, and separated often one from another by thin, narrow strips of tumefied, or dark red tissue, causing the intestine when laid open, either in the rectum, sigmoid flexure, or at the angles above, to appear like a dark red and extremely ragged or irregular surface, resting upon a thickened and hardened sub-mucous tissue as a base. Now and then a case will be met with in which these ulcerations have penetrated so deeply into the tissue that their base rests upon the peritoneal covering, and even occasionally penetrates this membrane, inducing the ordinary consequences of intestinal perforations, namely: general acute peritonitis and death.

Prognosis.—The prognosis in purely chronic dysentery should always be given with caution; for though there are many of the milder class of cases, in which the anatomical changes to which I have alluded are of limited extent, and patients under judicious treatment, both in regard to hygienic measures and medicine, will recover, yet in other cases where these changes are very extensive, occupying a large part of the surface of the colon, they will be found entirely incurable. All remedies, however varied and judiciously applied, prove only palliative in their effects, and the disease proceeds until the patients are ultimately reduced to a fatal degree of exhaustion. In their management, the regulation of the diet and drinks is a matter of very great importance. The principle should be here as in all cases of dysentery and diarrhœa, to have the patient use such articles of nourishment, and in such forms as are capable of being most perfectly absorbed and converted into nutritive material and taken up by the vessels of the stomach and first part of the alimentary canal, leaving the smallest possible amount of fæcal residue to pass over the diseased surfaces, whether in the ileum, colon or rectum. As I

have had occasion several times to remark, the material which answers this purpose perhaps better than any other, and at the same time possesses all the ingredients necessary for supplying the human system is milk, either alone or mixed with a small proportion of lime-water, or still better, with a small proportion of wheat flour, in the form of a thin homogeneous flour and milk gruel. While this constitutes the best basis for nutrition that has been devised, to prevent the patient from becoming disgusted with its constant use, it may be alternated with more or less of the various animal broths, such as beef tea, chicken broth, mutton broth, all of which, when used, should be seasoned with salt to suit the patient's taste. Sometimes it will be well to give the patient the albumen of egg, separated from the yolk, and simply intermixed or suspended in water, administered in small quantities.

The patient should avoid taking all such vegetables as consist mostly of starch, like potatoes, very tender bits of meat being much more likely to be digested and well borne than potatoes, beets, or even most varieties of bread. As a rule it is better that the patient take nourishment in very limited quantities, and at such stated intervals as will give a reasonable amount of support in every twenty-four hours, experience having fully shown that when the secretion of gastric juice is lessened by wasting disease, if any form of nourishment is taken in considerable quantities, a portion of it is very liable to undergo fermentation, and create more or less disturbance, before the whole of it can be taken up by the absorbents. Whereas, if the same material is taken in smaller quantities and at such intervals as will allow what is taken at one time to have been fully absorbed before the next quantity is taken, the patient will avoid the retention of any long enough to undergo fermentation, and yet he gets the amount necessary in the twenty-four hours. In regard to the remedial agents to be used in the treatment of chronic forms of dysentery, I can give you no better direction than to use the same formulæ that I have already given for the treatment of the advanced stages of the acute form of the disease, simply adjusting the doses, and the time of their administration, in such a way that they shall so far control the discharges as to keep them as near one in the twenty-four hours as may be possible, until the injured portions of the inflamed membrane can undergo the process of reparation and cicatrization. The patient should persistently use some combination which possesses the qualities of a soothing or anodyne agent, with that which will increase the tone or contractility of the vessels of the inflamed part, thereby constantly repressing the excess of blood in the tissue, and lessening also the morbid susceptibility, until a renewal of nutrition, granulation and cicatrization is induced in the ulcerated parts. At the same time the capillary vessels and circulatory organs will be aided in removing from the thickened and indurated structures any adventitious material that may have been added to them by either exudation, cell proliferation or any other mode of thickening and hypertrophy of the connective tissue. In my own experience, though trying a large variety of remedies as they have been suggested from time to time, I have found none to succeed better in the treatment of the different grades of chronic dysentery, than either the turpentine, oil of wintergreen, and laudanum emulsion; carbolic acid, ipecac and opium pills or capsules; or nitrate of silver, hyoscyamus and opium in the form of pills, all of which I have already mentioned in speaking of the treatment of the more acute form of the disease. It is impossible to give a rule by which you can judge, in any given case which of these formulæ will be productive of the greater amount of good. Observation has fully satis-

fied me that direct clinical trial is the only test. I have found a considerable majority of the cases of chronic dysentery to be benefited in a greater degree and for a longer period of time by taking four cubic centimeters (fl. ʒi) of the turpentine and laudanum emulsion from three to four times in the twenty-four hours, than from either of the other combinations alone. Next to this I have placed the combination of carbolic acid, ipecac and opium; and as the third in rank in its applicability to these cases, the nitrate of silver and opium. But there are very many of this class of patients who are obliged to have treatment for a long period of time. Many of them will progress favorably under the influence of one of these combinations for one or two weeks, when they will cease to make further improvement. If you persist in giving the same remedies they will begin to retrograde, the discharges become again very frequent, and the patient of course very much reduced.

But if, as soon as the patient, who has been improving up to a given time, ceases to make further progress in that direction, you immediately substitute one of the other preparations, the new impression will very generally carry the improvement still further, and the patient will make a steady but slow progress in the direction of recovery for a time, and again begin to show indications of receding. This is an indication that the medicine should be again changed either to the first formula or to the third one. By thus changing from one to the other at suitable times, always continuing to use one persistently as long as the improvement continues, and by substituting another which will give a little different impression, and yet have the same general end in view, you will succeed in greatly improving patients, that without such a succession of remedies would have ceased to improve and proceeded to an early fatal termination. An item of much importance in the treatment of these chronic cases of disease is the securing for the patient good air, cleanly and healthy surroundings, almost entire rest during a part of each day as well as at night in a recumbent position, and a steady, persistent regulation of the diet on the principles that I have indicated. If all these circumstances can be made to co-operate, some one of the formulæ that I have mentioned will almost always be found greatly to mitigate the suffering of the patient, and to prolong his life, if it does not cause positive reparation of the injured structures and lead to recovery. In addition, however, to the list of remedies I have already mentioned, in some cases where the patients have become much anæmic, I have found a powder, composed of the sub-nitrate of bismuth, from three to five decigrams (gr. v to viii), sub-carbonate of iron from one to two decigrams (gr. iss to iii) and pulverized opium six centigrams (gr. i) given from three to four times a day to produce very decided amelioration of the symptoms, and in a few instances apparently turn the scale in favor of permanent improvement and ultimate recovery. In a few instances, also, of somewhat similar character, I have used bromine rendered soluble with the bromide of potassium in the proportion of eight minims of the bromine, four grams (ʒi) of the bromide of potassium, in one hundred and eighty cubic centimeters (ℨvi) of water; of which from four to six cubic centimeters (ʒi to ʒiss) may be given, further diluted with sugar and water, every four, six or eight hours, according to the effect desired.

In some cases of long standing, where the patients had become exhausted, the stomach irritable, the mucous membrane of the mouth and fauces apthous and tender, I have rendered the patients much more comfortable in all respects, by giving frequent doses of an emulsion made in the same manner as the turpentine and laudanum emulsion, only substituting

the same amount of pulverized gum-benzoin for the oil of turpentine. The gum-benzoin thus rubbed up with sugar and tincture of opium will not dissolve in the mixture, but remains suspended only, of which some will fall to the bottom while standing, and consequently the mixture should be well shaken up whenever it is poured out. But it is devoid of any qualities calculated to offend the stomach, and has sometimes produced very pleasant and ameliorating effects. It may be given in the same doses, and with the same frequency as the ordinary turpentine and laudanum emulsion. I have now spoken of the strictly inflammatory affections, acute and chronic, which are met with in ordinary practice, in the different portions of the interior of the alimentary canal, from the mouth to the anus. There remain of the digestive apparatus, the exterior or peritoneal covering of the intestinal canal, and the important glandular structures in the mesentery, the liver, spleen, and pancreas yet to be considered.

LECTURE LV.

Peritonitis—Peritoneal Enteritis—Their Causes, Clinical History, Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The peritoneum, like the pleura and pericardium, is a complete sac, composed of serous membrane, lining the interior of the abdominal cavity and reflected over the mesenteric glands and intestines, including the upper portion of the pelvic viscera, and the exterior of the liver, spleen, and in a less direct manner, the kidneys and pancreas. Like the other serous membranes it is composed largely of connective tissue, a layer of lymph ducts, a vascular net-work, an abundance of lymphoid cells and canals, with a free surface of polygonal cells, or what is usually called endothelium. The membrane thus composed possesses a high degree of absorbing power, taking up readily almost any substance in a fluid form, that is placed in contact with its surface. Consequently it imbibes actively septic matters, which may be formed in adjacent tissues and organs, or that may be derived from perforation and escape of the contents of the intestines, stomach or other hollow viscera, with which it is connected. It is subject to attacks of inflammation of all grades of severity or activity from the most acute and rapidly progressive, to the most slow and chronic form of disease. It is subject to acute attacks that rapidly involve a large portion or all of the membrane, and in other instances it may be circumscribed or limited to a very small part of it. The latter cases are what are called circumscribed peritonitis, and usually result from the extension of inflammation to the peritoneum from viscera previously inflamed, to which the peritoneum is attached—or from perforations that allow the escape of irritating material, and the establishment of a primary local inflammation of the membrane surrounding the perforation. The chronic form of inflammation may occur idiopathically, or it may be the sequel of an acute, or subacute attack. And like the acute grade of the disease it may be either general, involving the whole membrane, or it may be limited to a small portion of it. For practical purposes, it is convenient to consider inflammations of the peritoneum under three heads:—acute diffuse peritonitis, acute and subacute circumscribed peritonitis, and chronic peritonitis.

Acute General Peritonitis.—As an idiopathic affection arising from ordinary atmospheric causes, acute inflammation of the peritoneum is of rare occurrence. Cases, are, however, occasionally met with arising from sudden and severe exposure to cold and wet, excessive exercise and from mechanical injuries. But far the larger proportion of cases originate secondarily during the progress of inflammation in organs, with which the peritoneum is in contact. I have already had occasion to mention that in mucous-enteritis, collitis and gastritis, the inflammation not infrequently extended during its progress to the peritoneum, and sometimes spread diffusely over the surface of this membrane; particularly was this mentioned as frequently occurring in connection with typhlitis and perityphlitis. It is also liable to occur as the result of all forms of severe intestinal obstruction, whether from irritation of the circular fibers of the muscular coat, indueing contraction of the intestine of a tonic and persistent character, from concretions and tumors, or from positive intussusception. But among the more frequent causes capable of developing rapid and fatal peritonitis, are intestinal perforations either during the latter stages of typhoid and typhus fevers, or during the progress of chronic gastric ulcers, or perforations of the vermiform process, or of the gall bladder and escape of bile, and sometimes though rarely of a rupture of the ureter, or of the pelvis of the kidney, or from suppuration in one or more of the mesenteric glands, the abscess maturing and perforating the peritoneum, and allowing the escape of pus. Similar results sometimes take place also in abscesses of the liver, perforating the membrane covering that organ and allowing pus to escape into the cavity of the peritoneum. Cases of general peritonitis have also occurred from the escape of injections directed into the uterine cavity, through the Fallopian tubes into the cavity of the peritoneum. Acute general peritonitis also arises not infrequently in the progress of metritis, and sometimes from pelvic cellulitis, and almost always accompanies that severe form of disease called puerperal fever, or puerperal peritonitis. But as puerperal fever proper is a disease arising from a specific cause in connection with child-bed, and is fully considered in nearly all works upon midwifery and diseases of women, we shall not include it in our further discussion of this subject.

Symptoms.—Acute, general peritonitis usually commences abruptly, and in the larger proportion of cases is accompanied in its beginning by a more or less distinct chill. Coincident with the occurrence of the chill, which is usually of brief duration, there is a sense of soreness and tension in the abdomen, with frequent, sharp lancinating pains, with more or less sense of heat or burning in the interval between the sharp pains. As the sensation of chilliness or the cold stage passes by, the cutaneous surface generally becomes dry, and increased in temperature from two to four degrees above the normal. The pulse becomes rapidly increased in frequency, usually numbering from one hundred to one hundred and ten per minute, before the end of the first twenty-four hours. It is usually rather soft, compressible, as well as frequent, though sometimes it is tense and firm under the finger. The respirations are short and increased in frequency, being suppressed in some measure by the voluntary efforts of the patient, on account of the increase of pain caused by full inspirations. As the febrile stage is developed, the pains in the abdomen become more severe, the tenderness to pressure very acute, and all motions of the body in turning or moving in any direction increase the pains in a marked degree. The respirations are stifled on account of the descent of the diaphragm crowding upon the abdominal viscera, causing much increase of

pain. The bowels are almost always constipated from the time of the supervention of the inflammation or tenderness, there being no disposition to further intestinal discharges. Some instances have been observed, indeed two have recently come under my own observation, in which immediately preceding the supervention of chilliness, and commencement of symptoms of local inflammation, the bowels had been evacuated freely two or three times. In the later stages of the disease, however, the inflammatory action extends into the coats of the intestines sufficiently to induce, in many of the cases, more or less active diarrhœa. The stomach, in the diffuse acute peritonitis very generally becomes more or less irritable, and vomiting in many of the cases is a very troublesome and distressing symptom. The contraction of the abdominal muscles in the act of vomiting causes very great increase of pain and soreness, and sometimes apparently adds much to the prostration of the patient. The urinary secretion is usually much diminished in quantity from the beginning of the disease, and redder than natural, very generally voided with little difficulty, but sometimes with decided pain or scalding. There is usually much thirst; a very anxious expression of countenance, at first a white coat upon the tongue, turning more or less brown and dry as the case progresses; there is much thirst and desire for cold drinks, and yet vomiting is often provoked by the use of the smallest quantity of liquids. The matters ejected by vomiting are at first simply the contents of the stomach, but subsequently mixed more or less with a mucous or serous fluid, usually colored deeply, with the coloring matter of bile, altered by the action of the acids of the gastric secretion to a green hue. If the case progresses unfavorably, in from three to four days the matters ejected by vomiting become greatly increased in quantity, of a dark brown color, and are ejected more by a regurgitation, than the ordinary process of vomiting. Occasionally there will be indications of blood in the matters ejected.

And if diarrhœa supervenes in the advanced stage, the discharges are usually of a dark brown color, offensive in odor, and also sometimes intermixed with blood. As the fatal result draws near, the urinary secretion is often suppressed entirely, the pulse becomes extremely rapid and feeble, the extremities cold and bluish, eyes sunken, expression of countenance haggard, the mind inclined to be drowsy and dull, and occasionally, wandering, or muttering with a low form of delirium. In connection with these symptoms the discharges become involuntary, the sphincters relaxed, the chin dropped, the respirations shorter and shorter, until life ceases. Death is said to take place from asthenia or exhaustion. In the most acute form of the disease, diffuse peritonitis frequently passes through its successive stages and terminates fatally in from three to five days. Perhaps the average duration of acute cases is from five to seven days. In addition to the symptoms that I have already mentioned, abdominal distension or tympanitis is a prominent and important one. It usually commences early after the beginning of the disease, and oftentimes is extreme—the abdomen being distended to such an extent with the arrest of gases in the intestines, that the distension is not only painful to the patient, but it crowds the liver, stomach and diaphragm upwards to such an extent as to greatly lessen the capacity of the chest, and consequently to render the aeration, or oxygenation and decarbonization of the blood very deficient. This diminution of the capacity of the chest for air, and the consequent failure of the natural function of respiration, greatly increases the rapidity of failure in the strength of the pulse, developing cold extremities, blueness of the lips and ends of the fingers, early somnolency, suppression of urine, and death. More or less of abdom-

inal distension, and acute tenderness to pressure,—the tenderness and pain on pressure being increased in proportion to the depth of the pressure,—are symptoms that are perhaps more distinctive of this form of inflammation than any other that we have enumerated. While the great majority of cases of acute diffuse peritonitis commence in the manner I have indicated, by chilliness and an abrupt development of inflammatory action or symptomatic fever, there are a few cases in which the disease develops gradually, and without marked chill. The patient complains of a progressively increased sense of soreness and pain, aggravated by pressure and motion of the body, as in walking or upon turning from one side to the other, for two, three or even four days before sufficient general febrile movement and feeling of sickness supervene to seriously attract the attention of the patient. But when once developed it pursues the same general course that we have already described. Again, cases have been met with, though very rarely, in which the symptoms of the disease were entirely masked or latent; there being neither any considerable amount of pain locally in the abdomen, tenderness, nor any apparent general fever; and yet the patient became rapidly and fatally exhausted.

When the disease arises from a local cause, such as perforation of some of the hollow viscera in connection with the peritoneum, or from extension of inflammation from other parts, there is less liability to chilliness at the time the peritoneal inflammation commences, and the local symptoms are usually at first circumscribed—that is, the pain is seemingly limited at the outset to the neighborhood or locality, where the perforation of the peritoneum or inflamed viscus exists; but the extension may be so rapid as to cause diffusion of the inflammation over the whole membrane, within a few hours after it has established itself at the original point of attack.

Anatomical Changes.—The anatomical changes which take place during the progress of acute, diffuse peritonitis are the same in kind that occur in acute pleuritis and pericarditis. There is intense injection of the vessels of the membrane, causing a deep red color, sometimes bordering upon a brown; at other times a greenish hue, with more or less tumefaction or apparently increased thickening of the membrane, and accumulation or exudation of fibrinous material, lymphoid cells, white corpuscles, and more or less serum in the interstitial spaces of the membrane, and subjacent connective tissue. At the same time there is more or less exudation upon the surface of the membrane, in some instances of a plastic or fibrinous character organized into white layers of adventitious tissue adhering to the surface and sometimes causing coils of intestines lying in contact to be more or less adherent to each other, and to the inflamed surface. More frequently in addition to a moderate amount of this semi-plastic exudation, there is also an exudation of serous fluid, containing more or less of pus corpuscles, shreds of a fibrinous material, and sometimes enough of the red corpuscles of the blood to give it a reddish appearance. In other instances instead of either a plastic or serous exudation, the accumulation upon the surface of the membrane is almost entirely purulent. Perhaps the great majority of cases that terminate fatally present all three of these inflammatory results coincidently;—namely, fibrinous exudation forming layers upon the surface of the inflamed membrane, with a pretty abundant serous effusion freely intermingled with pus corpuscles, so as to constitute a sero-purulent accumulation. When the inflammation causes only a serous exudation, it may pursue the same course as any serous exudation into the pleura or pericardium, namely, absorption and consequent recovery of the patient, without leaving any unpleasant *sequelæ*.

In those cases, however, in which the accumulation in the cavity of the peritoneum is purulent, complete absorption will not take place, and in the great majority of cases it will cause a fatal termination. In a few instances, however, even of purulent accumulations, the serous part of the pus has been removed by absorption, leaving a white or yellowish white cheesy mass, which has appeared capable of remaining in that condition without further change for a considerable length of time. In a few instances in which post-mortems have shown the absorption of the serous part of these sero-purulent effusions, there has been left a substance closely analogous to colloid material. Where there has been plastic exudation, and yet the inflammatory action subsides without fatal prostration, a slow disintegration of the partially organized fibrine has taken place until it has entirely disappeared. But much more frequently it only partially disappears by this process, and the remainder becoming more highly organized remains as new tissue and causes either permanent thickening of the peritoneal membrane, or more frequently permanent bonds of union between what would otherwise be free surfaces,—attaching coils of intestine to each other, thereby embarrassing the natural peristaltic motion, and often inducing colic, and other troublesome intestinal derangements. Sometimes these bands of false tissue contract in the process of time so as to form constrictions and troublesome obstructions of the bowels, and occasionally give rise to an entanglement of loops of intestine in such a way as to produce complete strangulation and death of the patient at some remote period of time from their original formation.

Diagnosis.—The diagnosis of acute peritonitis is not difficult. The acute tenderness of the abdomen to pressure, the pain being increased in proportion to the depth of the pressure, directly associated with increased rapidity of pulse, increased temperature, acute lancinating pains greatly aggravated by any motion of the body, certainly distinguish the disease, even in its early stage, from almost any other morbid condition that can be named. And the distinguishing features, both general and local, become more prominent as the disease progresses. There are some cases, however, of hyperæsthesia or morbid sensitiveness from a peculiar condition of the nervous system, in which there is an apparent extreme sensitiveness of the tissue over the abdomen, and which might at first be mistaken as evidence of peritonitis. But in all classes of cases of myalgia, neuralgia or hyperæsthesia, the tenderness has this distinctive character: that it is superficial, and the patient gives some evidence of pain and shrinks from slight touches upon the surface, as much as he does from steady firm pressure. And in almost all such cases, if the palm of the hand is placed upon the abdomen and steady continuous pressure made, it is found that the patient complains no more than he did from the slightest touch of the fingers upon the surface. The reverse of this, however, is true of peritonitis. In all forms of inflammation of the peritoneum, very slight pressure upon the surface creates but little uncomfortable sensations, while the more firm and deep the pressure the more acute the pain the patient suffers. Another characteristic of peritonitis which aids in maintaining the diagnosis is the rigidity of the abdominal muscles.

This is more particularly noticeable in the recti muscles before the abdomen has become too greatly distended by tympanitis. If you thus give due attention to the character of the tenderness, and the effects of deep pressure as distinguished from mere superficial touches, the condition of rigidity or non-rigidity of the abdominal muscles, and remember that in connection with this, in the inflammation of the peritoneum, there is more

or less general constitutional disturbance, such as pyrexia, unusual rapidity of pulse, a correspondingly short, stifled and frequent respiration and occurrence of pain on any attempt at such motion of the body as will disturb the abdominal cavity, you will not be liable to confound acute peritonitis with any other variety of disease.

Prognosis.—The prognosis in acute diffuse peritonitis should always be given with caution. If the disease is recent and from exposure to cold or wet, or from ordinary accidents in previously healthy conditions of the system, under judicious management a large majority of cases will recover. So, too, when it originates simply from extension of the inflammation from other organs with which the peritoneum is in contact, there is a strong probability that the case will terminate favorably, provided the primary disease can be controlled; as the same means which have answered for its control, will be sufficient also to limit and finally overcome the peritonitis. Cases to which I have alluded as favorable in their prognosis are usually accompanied only by plastic or sero-plastic exudations. But when the disease occurs as the result of perforations of the intestines, or any of the hollow viscera or parts connected with the peritoneal membrane, or from absorption of septic or poisonous material from disease or suppurative processes in any of the viscera, or in the advanced stage of renal disease and dropsical effusions, the prognosis is extremely unfavorable. In nearly all such cases the inflammatory products assume early the form of pus. And whenever accumulations, taking place in the peritoneal cavity, are purulent, the patients become early exhausted and very rarely recover. Still there are some instances in which the inflammation supervenes from direct perforation and escape of material from the intestines or from some of the hollow organs in connection with it, and yet exudation thrown out rapidly around the point of opening causes so early an adhesion to the parts lying in contact as to set bounds to the further escape of material through the perforation, and also to prevent whatever suppuration takes place from becoming diffused through the whole of the peritoneal surface. Thus the inflammation is purely circumscribed, and the exudative material is limited to the small space in immediate connection with the original opening. Such cases have occasionally ended favorably. Sometimes by the reabsorption of the accumulated products of the inflammation, more frequently by enlarging the opening and permitting their escape into the intestine and discharge through the alimentary canal, or by the formation of a circumscribed accumulation of pus capable of being early recognized by palpation, and removed either by aspiration or by free incision through the abdominal walls. Such instances, however, are comparatively rare.

When around a circumscribed inflammation, plastic material has been thrown out, adhesions have been formed, and at the same time serous effusions have occurred from the inflamed surface, these effusions, instead of being allowed to enter into the general cavity of the peritoneum, are limited by the adhesions to a part of the cavity, and thus constitute what has been called an encysted ascites. This is capable of reabsorption like any other serous fluid, allowing the patient ultimately to recover, or if reabsorption does not occur, and the parts become distended sufficiently to reveal the true nature of the case, paracentesis in the ordinary manner, or aspiration may cause its removal, and contribute to the patient's ultimate recovery. The danger, however, from aspiration, or incisions, and from the use of the ordinary trochar in such a circumscribed accumulation is in the liability of having the instruments perforate some portion of the

intestines. This must be kept in mind as an important item where such operations may be deemed advisable.

Treatment.—When acute or subacute peritonitis occurs from accidental or atmospheric causes in previously healthy conditions of the system and the physician is called early, advantage may very generally be derived from a moderate local bleeding by leeches. It is seldom that venesection will be required, though in some instances where the pulse is full and firm under the fingers, the symptoms have supervened rapidly, and the abdomen become extremely tender with great pain, it may be admissible to practice one free venesection at a very early period in the progress of the disease. I hardly remember a case presenting these features sufficiently to justify or require the use of the lancet, but when called early I have derived very much advantage from pretty free application of leeches, allowing the blood to flow after the leeches have fallen off, encouraging it by the application of cloths dipped in warm water, and subsequently keeping the abdomen covered with warm narcotic fomentations.

The leading object of the treatment is to directly arrest the inflammatory process, less by diminishing the vascular fullness than by overcoming the morbid excitability of the inflamed structure by the use of anodynes and sedatives. Not only do anodynes here act in the direction of overcoming the morbid excitability of the inflamed structure, but they are most efficient agents for putting the inflamed parts at rest, a condition very essential in the treatment of all inflammatory processes. Motion of the parts and peristaltic motion of the bowels especially, greatly increases the pain and the intensity of the inflammatory process. Hence to put the bowels entirely at rest and keep them so, until the inflammation has abated, is one of the essential features of judicious treatment. And one of the most common errors that is committed consists in the early administration of evacuants which tend directly to increase the peristaltic motion under the delusive idea, that it is essential to empty the alimentary canal. This causes patients also to be disturbed in getting up and moving for the evacuations, thereby greatly aggravating their condition instead of affording relief. In the cases to which I have just alluded, where the patient is not previously in a depraved condition of health by prior disease, or constitutional impairments, I have preferred the administration to adults, during the first twenty-four or thirty-six hours of full doses of opium in connection with small doses of mercurials; more particularly of the mild chloride or calomel. From two to three centigrams (gr. $\frac{1}{3}$ to $\frac{1}{2}$) of the sulphate of morphia, and six centigrams (gr. i) of calomel in the form of a powder, with a little white sugar, may be given every two, three or four hours according to its effects, beginning with a shorter time till the patient has been brought sufficiently under the influence of the medicine to be free from pain and decidedly inclined to sleep. If the administration of these powders is commenced in direct connection with the application of leeches, and later is followed by narcotic fomentations as I have indicated, there are many cases in which the first three doses will cause almost entire relief of the pain and restlessness of the patient, and induce the beginnings of sleep. As soon as this effect is produced the interval between the doses should be increased, first to three hours, then to four hours, and kept only at such intervals as will serve simply to perpetuate the restful condition of the patient without inducing profound stupor. The result will usually be that in from twenty-four to forty-eight hours, under sufficient narcotic influence to produce the degree of rest I have indicated, the pulse will become slower, the temperature reduced, the

skin covered with a warm moist perspiration, and the local pains and tenderness greatly diminished. When these results have been obtained do not immediately risk a reversal of the favorable aspect of the case by at once resorting to cathartics, but allow the bowels still to remain at rest leaving out calomel, and continuing the opiate preparation alone at just such intervals as will keep the patient in a comfortable condition of rest. At the same time that calomel is omitted, give in addition to the anodyne in the interval between the doses of it, some diuretic. For this purpose we have nothing better than an equal mixture of the liquor ammonii acetatis and nitrous ether, four to eight cubic centimeters of which may be given, diluted with a little water, between each of the doses of the anodyne. If the case progresses favorably as most of them will, of the kind I have now under consideration, by the end of the third day the tenderness will have almost entirely disappeared from the abdomen, there will be little or no tympanitis, the pulse will have returned nearly to its natural standard and with the exception, in some instances, of a mild degree of secondary nausea from the effects of the anodynes, the patient will be entirely comfortable. Where six centigrams (gr. i) of calomel have been given in connection with the first five or six doses of the anodyne, the bowels will now in many of the cases begin to move spontaneously, not with pain but with entire ease; the discharges being usually semi-fluid, or only moderately consistent, and pretty copious, and where they occur not more than two or three times, they need not be interfered with. But if the number of the discharges increase, become more thin, and are accompanied with some pain in the abdomen, measures should be taken immediately to arrest their further occurrence, and put the intestines more perfectly at rest.

This may often be done by renewing a little more frequently the doses of morphine, or still better, so far as my experience goes, by giving in place of the morphine what I have frequently mentioned to you as the ordinary turpentine and laudanum emulsion, in doses of four cubic centimeters (fl. ʒi) after each evacuation until they have entirely ceased. After the bowels have been freely moved, either spontaneously or by warm water enemas thrown into the rectum, if there appears to be no tendency for loose discharges and pain to continue, full convalescence ensues, and the patient requires little other treatment than rest, and a very mild unstimulating diet, taken in small quantities for three or four days. At the end of that time, if no renewal of symptoms occur, he may be allowed to rise from the bed, and occasionally to take exercise. But the convalescent in all such cases should be carefully guarded against all excesses both in exercise, as walking, or motions that jar the abdomen, and in indulgence in promiscuous diet. But where cases are not seen quite as early as I have indicated and the disease has made more progress before coming under observation, it may not be judicious to apply leeches or practice any local bleeding. But the warm narcotic fomentations may be applied over the whole abdomen, and opiates may be administered, each of the first three or four doses being combined with six centigrams (gr. i) of calomel. The anodyne should be given in sufficient doses with sufficient frequency to bring the patient fairly under its sedative influence and place him at rest as early as practicable without leading to profound narcotism. The combination of liquor ammonii acetatis and nitrous ether to encourage continued action of the skin and kidneys may, if retained by the stomach, be given between the doses of the anodyne. And to prevent the stomach from becoming irritable and the supervention of troublesome vomiting, the patient should be encour-

aged to take only bits of ice to satisfy thirst and a single spoonful at the time of bland nourishment such as lime water and milk, or some one of the animal broths. After the first twenty-four hours of the treatment, the calomel which had been incorporated with the first four or five doses of the anodyne should be omitted. The anodyne and the diaphoretic may be continued, and if the tympanitis increases, the abdomen may be frequently painted over either with a liniment of camphorated soap and iodine in such proportion as to render it decidedly stimulating to the surface, or there may be applied freely over the surface a mixture of olive oil and oil of turpentine, the latter being in such proportion as will produce an active irritation. These applications may be repeated once in three or four hours, and in the intervals the narcotic fomentations may be kept over the abdomen. These, however, must be made light, for anything heavy especially thick poultices over the tender abdomen usually increase the suffering of the patient more than they do good. If these measures succeed in arresting the further progress of the disease, the patient may remain at rest two or three days during which the pulse will become slower, the temperature diminish and all the phenomena of inflammation disappear.

If now spontaneous evacuations do not occur, steps may be taken to cautiously induce movement of the bowels by enemas as I have already described. But the administration of cathartics is entirely injudicious, on account of the danger of renewing the pain in the abdomen and of causing the return of all the phenomena of the peritoneal inflammation. And sometimes the operation proceeds to such a degree of profuseness as to hasten the patient into an early collapse. Consequently unless evacuations spontaneously occur it is far better to wait, for a whole week, than it is to resort to anything more than mild enemas until convalescence is well established. My experience has been, that in a large proportion of cases spontaneous evacuations occurred before the end of the third or fourth day. It is much more frequently necessary to institute measures for limiting and ultimately arresting these spontaneous evacuations than it is to give cathartic medicines of any kind. One of the embarrassments that you will meet with in the treatment of acute peritonitis, is the excess of irritability of the stomach. And for the first two or three days you will frequently find it impracticable to administer a sufficient amount of anodyne by the stomach to obtain the quieting effects that you desire. In such instances hypodermic injections of morphine should be resorted to, allowing the stomach to remain entirely at rest. Always use hypodermic injections, however, in safe doses, and take the trouble of repeating them rather than risk doses so large as to produce excessive narcotism, especially when the abdominal distension may be, at the same time, so great as to have limited the respiratory function and consequently the oxygenation of the blood. In such conditions the subcutaneous injection, of even ordinary doses of morphine have been known to speedily produce so profound a narcotism as to prove fatal within a few hours. And yet the judicious use of subcutaneous injections in some of these cases becomes necessary and highly valuable. It is true that in some they may be avoided by the use of anodyne enemas. But these are less likely to be retained, are slower in producing their effects, and in other respects less reliable than the use of the remedy subcutaneously. It is a frequent practice to apply blisters extensively over the abdomen in peritonitis, at that stage when effusion is liable to commence, or what is called the second stage of the disease. I have sometimes seen decided

advantage apparently derived from their use; but in the great majority of cases it is sufficient to apply the stimulating embrocations and liniments that I have already mentioned. If the acute stage passes by and partial convalescence supervenes, leaving the abdomen enlarged from the accumulation of serous effusions, as sometimes happens, it may become desirable to apply a succession of small blisters over the abdomen in connection with the internal use of suitable doses of the iodide of potassium sometimes combined with digitalis. The use of iodide of potassium in combination with digitalis internally, and moderate counter-irritation externally, will also constitute the best remedies when the inflammation assumes a chronic form. If the amount of fluid in the peritoneal cavity is large and there is manifest but little disposition to diminish under the use of these remedies it may be removed by the aspirator or by the ordinary method of paracentesis abdominis, and its reaccumulation retarded if not entirely prevented by a continuance of the remedies I have already named, after the withdrawal of the fluid. If in the progress of the treatment of acute peritonitis the remedies I have indicated fail to arrest the disease, and the pulse becomes extremely rapid and feeble, the extremities cold and blue, the respirations short and frequent, the mind dull and wandering, the abdomen more or less distended, there is little prospect that the patient will recover, under any kind of treatment whatever. Opiates under such circumstances must be given more cautiously; and in conjunction with their moderate continuance, the patient may derive some benefit from the use of such diffusible stimulants as carbonate of ammonia, camphor, caffeine and theine; and digitalis as a tonic to sustain the heart's action. Stimulating embrocations over the abdomen may also be continued, and a vigilant administration of nourishment. Tablespoonful doses of wheat flour and milk gruel, beef tea, or other animal broths, and the frequent administration of one or two spoonfuls of warm tea or coffee such as is usually taken upon the table, will constitute the best means of support.

It is almost the universal practice in these cases to resort to the free use of alcoholic remedies, under the idea that these will aid in sustaining the vital forces and in preventing fatal exhaustion. I have never seen an instance, however, in which I could perceive the slightest beneficial effect from their use. In the cases of limited, or circumscribed peritonitis, if the inflammatory symptoms abate and yet leave accumulations, either of a serous or purulent character, the first will generally disappear by absorption under the influence of the measures I have indicated. If not, it can be removed by aspiration. In those cases where the accumulations are purulent aspiration may be resorted to, and if the pus is found to be too thick to pass the aspirator needle successfully and freely, larger openings may be made, the pus discharged, and the subsequent antiseptic treatment judiciously carried out with some prospect of success. Yet many such cases will ultimately fail under continued suppuration and die from exhaustion. What I have now stated in regard to the varieties of acute general or diffuse peritonitis, has included so much concerning the circumscribed form of the disease; and the management of this class of cases is so directly parallel in kind with that of the more diffuse, as to make a separate consideration unnecessary.

Chronic Peritonitis.—Chronic inflammation of the peritoneum may be the sequel of an acute or subacute attack, or it may originate independently of any preceding acute stage. A large proportion of the acute attacks accompanied by suppurative action and accumulation of pus or pus mixed with serum in the cavity of the peritoneum, degenerate into the

chronic form,and although often continuing a considerable length of time, ultimately terminate fatally. Many of those that I have mentioned as circumscribed inflammations of the peritoneum also terminate in subsidence of the general febrile symptoms, while the membrane will remain more or less thickened, with increased vascularity, some degree of tenderness and an increased accumulation of the inflammatory products so as to constitute, strictly speaking, a chronic form of the disease. Occasionally cases may be met with, in which chronic inflammation is developed in the peritoneum, or in some portion of it, as the result of mechanical violence, induced by falls or blows, but more frequently by far the cases of chronic inflammation of this membrane originate not from any acute attacks, but are from the beginning of that low grade called chronic, and having for their causes either the effusion of serous fluid into the cavity of the peritoneum from obstructions to the portal circulation, as in diseases of the liver, or in connection with general dropsy as in renal disease; the inflammatory action being secondary to the dropsical accumulations in such instances. Or they may originate from tuberculous deposits more frequently in that part of the mesentery covering the omentum, meso-colon and the exterior of the liver and spleen. In a very large proportion of the cases of general milliary tuberculosis, more or less deposits take place in the portions of the peritoneal membrane just mentioned, sometimes without exciting sufficient inflammatory action to attract attention, and in others being accompanied with a slow, insidious development of inflammation, exudation and effusion, sufficient to fill up the peritoneal cavity. In some patients of scofulous constitution, especially in early childhood the mesenteric glands become involved in hypertrophy and caseous degeneration in the same manner as the lymphatic glands in the neck or in the arm pits, and during their progress especially in the stage of softening, sufficient inflammatory action is set up to involve the peritoneum, entering into the formation of that part of the mesentery, in which the glands are located. But this form of disease was sufficiently described when speaking of the various conditions of scrofula in its local developments throughout the whole system. Another cause of chronic peritoneal inflammation is the formation of cancerous nodules in the omentum and involving the peritoneum in their progress, if not primarily originating in that membrane. Some of the cases of scirrhus of the pylorus, involve also more or less inflammation of the adjacent peritoneum, and the same is true when scirrhus exists in the liver, or in the spleen, near enough to the surface to involve the peritoneum covering them.

Symptoms.—When chronic peritonitis follows as the sequel of the acute form of the disease its symptoms consist chiefly of distension of the abdomen from accumulations of more or less serous or sero-purulent fluid accompanied by thickening of portions of the membrane and tenderness to pressure, particularly in circumscribed places. The pulse is moderately accelerated, the respiration usually shorter and quicker than natural, owing more to the mechanical impediment to the descent of the diaphragm than to any other cause. The skin is dry, and the temperature generally elevated two or three degrees in the afternoon and evening, while in the morning it falls to the natural standard. There is progressive loss of flesh and strength, impairment of appetite, scantiness of urine and a variable condition of the bowels, they being sometimes costive, and at others too loose, and in many cases, constipation and diarrhœa alternate with each other at frequent intervals. Under direct examination of the abdomen in such cases, in addition to tenderness on firm pressure, there is in most of the

cases, a feeling of inequality in different portions of the abdomen, some places being harder and more prominent, apparently from the thickness of portions of the peritoneal membrane lining the abdominal walls. Also more or less dullness on percussion and usually plain fluctuation, indicating the existence of fluid.

The dullness on percussion and the fluctuation by palpation is most evident in the most dependent parts of the abdominal cavity, according to the position of the patient. In lying upon the back there will be frequently well marked tympanitic resonance in the epigastrium and portions of the umbilical region, while the hypochondrium and lumbar regions are entirely dull, and afford plain fluctuation. After the disease has assumed a strictly chronic form, there are not usually severe pains, and yet most cases will be characterized by moderate lancinating pains at intervals, especially when the patient has attempted to exercise or to make any considerable movements of the body. There is also a sense of increased heat in the abdomen in the majority of cases. Frequently there is sympathetic disturbance of the system, imperfect digestion of food, occasional vomiting, particularly in association with the appearance of diarrhœa in the advanced stage of the disease. When the chronic peritonitis has resulted as a secondary affection in the progress of either renal or hepatic diseases, inducing a dropsical condition of the system, the evidences of the peritoneal inflammation are often very obscure—the prior disease having already debilitated the patient, altered the condition of the blood, and induced in the renal cases general dropsy, and in the hepatic, more or less circumscribed accumulations in the peritoneal cavity; all the symptoms are very apt to be referred to the original disease, and yet close inquiry will show, that whenever the peritoneal membrane actually takes on inflammatory action, there is an increase of febrile movements, accelerating the pulse beyond what it had been in connection with the previous disease, causing more or less increased sense of soreness, and sometimes sharp pains throughout different places in the abdomen, with tenderness to pressure, especially in particular regions of the abdominal cavity, and more rapid distension of its walls from the accumulations of fluid within. The patient almost always finds great difficulty in turning from one side to another, without feeling a sore pain run deeply through the abdomen, and attempts to walk also generally give rise to feelings of sore pain from the concussion. In most such cases, the effusion into the cavity becomes so great in a few weeks, or months, that the diaphragm with the liver and spleen are crowded strongly upward, trespassing upon the capacity of the chest, and so far interfering with the expansion of the lungs in inspiration as to cause great inconvenience to the patient, from shortness of breath, sense of suffocation or oppression, and often a relaxation of the skin with cold perspiration, blueness of the lips, coldness of the extremities, inability to recline in the horizontal position, or to assume any except one nearly upright. In such cases usually the appetite is lost, the urine becomes nearly suppressed, and unless relief is obtained by removing the accumulated fluid, universal dropsical infiltration takes place into the tissues, causing general œdema and an early death. In other instances before this extreme interference with the capacity of the chest and the respiratory function, the patient becomes very much emaciated, apthous ulcerations appear in the mouth and fauces, all food becomes distressing to the stomach, or is rejected by vomiting, a wasting diarrhœa supervenes, and he dies from asthenia, rather than from interference with the respiratory process. When chronic peritonitis arises from tubercular deposits in the mesentery or

or meso-colon, or any of the parts connected with the peritoneum, the early symptoms are often exceedingly obscure. Patients most generally, for a considerable length of time, complain only of irregular pains in the abdomen, sometimes only momentary and sharp, at other times rather dull, or simply of a sense of soreness whenever from attempts at any sudden movements of the body the abdomen is jarred, coupled with a progressive loss of flesh, a sense of weakness, a quick rather small and compressible pulse, a slight elevation of temperature during the middle and latter part of the day, accompanied by more or less dryness in the mouth and fauces, less than the natural secretion of urine, a fickle or variable appetite, an equally variable condition of the bowels, being sometimes constipated and sometimes the reverse, and after from one to three months of these equivocal moderate symptoms the abdomen is found to be enlarging. In most instances percussion and palpation will readily determine that such enlargement is owing mainly to an accumulation of fluid. Sometimes, though rarely, the tubercular form of the disease will be accompanied by sufficient enlargement of some of the mesenteric glands, or by sufficient accumulation of tubercular masses with thickening of the membrane lining the abdominal walls, or of the omentum superficially, to be felt as hard bodies through the walls of the abdomen. And while detecting by manipulation or palpation the existence of such bodies there is also readily revealed more or less fluctuation of fluid and dullness over the more dependent parts of the abdominal cavity. But many of the cases are not accompanied by either sufficient accumulations of tuberculous deposits or enlargement of the glands in the abdomen to present any tumor that can be detected by an external examination. It is true in a very large proportion of these cases tubercular deposits are not limited to parts in the abdomen, but exist at the same time in the pulmonary tissue, or in the liver, or both. When the lungs are involved, physical exploration will usually detect their existence, if the physician's attention is turned in that direction. And finding actual tubercular deposit in the lungs or any other portions of the system, at once would render it highly probable if not certain that the abdominal symptoms to which I have alluded, also originated from tubercular deposits in connection with the peritoneal membrane as already described. And even in cases where there is no appreciable deposit in the lungs, if the patient is in the early part of life, and possesses a strong hereditary tendency to scrofulosis or tuberculosis as indicated by family history and symptoms, and the symptoms referable to the abdomen that I have described exist, it would justify the inference that they originated from tubercular deposits. When it has advanced far enough to occasion any considerable amount of serous or sero-purulent accumulations, then all the physical signs that were described in speaking of accumulations from the more acute form of the disease, equally characterize these cases.

That chronic peritonitis does occur from the localization of the tubercular deposits in the peritoneum and other parts in the abdomen, I have seen sufficient clinical proof. During the present college term there has been a patient in the hospital for a number of weeks, a lady about thirty-five years of age, who was admitted with the impression that she had an ovarian tumor, and evidently entertaining the hope that it might be removed by the ordinary operation of ovariotomy. Having my attention directed to the case on account of some cough and expectoration of a suspicious character, I found on careful physical exploration, plain evidences of extensive tubercular deposit in the upper and middle portions of both lungs, and one or two points commencing the second stage of their prog-

ress. And it was evident from the examination of the abdomen, that the distension there was occasioned not by ovarian cysts, but by actual accumulation in the peritoneal cavity, although at two or three places deep pressure would apparently bring the points of the fingers in contact with hard bodies. In the progress of this case the patient became much oppressed in breathing both from the fullness of the abdomen, which impeded the descent of the diaphragm, and from the disease in the lungs themselves. The abdomen presented well marked fluctuation. I thought to give temporary relief to the patient by evacuating the fluid contents of the peritoneum by the ordinary operation of paracentesis-abdominis. I introduced a good-sized trochar withdrawing the styllet but no fluid flowed. And yet the impression as it entered the abdominal cavity was perfectly characteristic of entering a fluid, and at the point of its introduction no solid body could be detected. Introducing an ordinary probe through a canula no resistance was found at the entrance of the canula, and on twirling it a little there came out a small quantity of a gelatinous mass or semi-fluid substance thicker and more gelatinous than the albumen of the egg. By continued manipulation, and pressure upon the abdomen and especially aided by the sudden pressure produced by the coughing of the patient, several ounces of this gelatinous material were withdrawn, which caused a considerable lessening of the previous tenseness of the abdominal walls. On withdrawing the styllet and canula, the cough continued and forced more of this material through the opening for the next hour—making perhaps in all that was withdrawn eight or ten ounces. This, however, was only a very small proportion of the quantity contained within. No inflammatory action followed withdrawal of this. The lungs were so much involved, that it was improper to give the patient any encouragement about ultimate recovery by any operative procedure, she therefore returned to her friends. This illustrated what sometimes develops in these cases of chronic peritonitis, namely: filling up of the abdomen more or less with a fluid mass so nearly of a gelatinous or thick consistence as to be incapable of removal through ordinary processes, either by the aspirator, or tapping with the trochar. In another instance of a girl fourteen years of age, the tubercular disease involved both peritoneum and mesenteric glands. Some of the latter after the abdomen had become much distended by sero-purulent fluid, containing flocculi or masses of fibrinous material which had separated from a portion of the colon to which they had been adherent, continued to suppurate until perforation of the walls of the intestines took place, and thus discharged the contents of the abdomen through the bowels; affording for a time a sensible degree of diminution in its size. The hectic, emaciation, and other symptoms continuing, in a few months the patient was worn out, when the post-mortem revealed what I have just described; namely, granular tubercles covering the surface of the peritoneum, throughout the whole of the omental part, of the meso-colon, and nearly the whole mass of mesenteric glands in different stages of enlargement and degeneration. Some being actually converted into purulent abscesses, and one larger gland, which had constituted an abscess, was collapsed, presenting more the appearance of a sac, the inner surface constituting the walls of the abscess, communicated still with the upper portion of the sigmoid flexure of the colon.

When chronic peritonitis arises from the existence of malignant or cancerous disease within the abdominal cavity, the symptoms so far as they depend upon peritoneal inflammation, do not differ materially from those I have just described as occurring in connection with

tubercular deposits. There is the same obscure beginnings, ending after a while in the accumulation of fluid, more rapid distension of the abdomen, accompanied by well marked fluctuation, and usually before the walls of the abdomen become too tense, or the accumulated fluid too large in amount, the existence of a cancerous tumor, can be more or less readily felt through the abdominal walls. Some writers have claimed that cancerous disease does not originate, or commence primarily, in any part of a serous membrane; particularly those who adopt the theory that all cancers originate in the epithelial structures; serous membranes having no proper epithelium, but only a layer of polygonal cells or endothelium. The evidence, however, favors the doctrine that sometimes, though rarely, cancerous developments do occur in the endothelial cells themselves; constituting properly an endothelioma, instead of an epithelioma. The distinction, however, is of little or no practical importance, as the results would be the same. The diagnosis between chronic peritonitis associated with tuberculosis from that associated with carcinoma or any variety of cancer depends not so much upon the symptoms belonging to the diseased peritoneum, as to those which belong to the primary affection. The distinctions are precisely those existing between the cancerous cachexia, with more isolated and harder tumors where tumors can be detected, and the tuberculous diathesis with the evidence of tubercular deposit generally distributed throughout many of the structures, instead of being limited to some one region, or to some one hard tumor.

Still another form of chronic inflammation of the peritoneum has been described as a hemorrhagic variety. This appears to be a rare affection occurring in the peritoneum, corresponding in its anatomical characters closely with what is called pachymeningitis in the serous membranes of the brain. There is first dilatation of the vessels in little patches on the peritoneum, then ruptures occur, and the escape of small quantities of blood, followed by sufficient inflammatory action, usually to throw out a layer of false membrane, limiting the diffusion of blood and constituting a strictly circumscribed inflammation, which is often accompanied by very obscure symptoms, and from which the patient apparently recovers in a little time. And the same recurs again and again at different intervals until finally a sufficient portion of the membrane becomes involved to induce serous effusion, and all the phenomena of abdominal dropsical accumulations. When the water is withdrawn it is very generally found tinged with blood, or contains an appreciable number of red corpuscles, and as its tendency is to reaccumulate, the patient becomes gradually exhausted, either from the extent of the accumulation, or the pressure of it upon the thoracic cavity and other important organs. If it is withdrawn by tapping or aspiration to avoid the distressing effects of overdistension, the withdrawal of the nutritive elements of the blood from continued exudation into the peritoneal cavity will lead ultimately to general exhaustion, impairment of function, universal dropsical infiltrations and death.

Prognosis.—From the description I have given of the various forms of chronic inflammation of the peritoneum, you will perceive that many cases tend to an ultimate fatal termination. It may be said that all the cases arising from tuberculosis, cancers, renal and hepatic diseases are incurable. Their progress may be retarded, temporary relief may often be obtained by removal of the accumulated fluid in the abdominal cavity either by aspiration or tapping; but the diseases which have given rise to the peritoneal trouble, being themselves incurable, there is an inevitable tendency to a fatal termination. The same may be said of such cases as originate

in connection with either general dropsy from cardiac and renal disease or from direct obstruction of the portal circulation by cirrhosis or other structural diseases of the liver. But in cases which have originated from moderate subacute and acute attacks in which no suppuration has occurred, but simply thickening, and continued congestion of the peritoneal membrane, accompanied by more or less serous effusion into the abdominal cavity, frequently accompanied by a moderate degree of plastic exudation which form patches of organized membrane, and sometimes constitute bands of adhesion between different coils of intestine, or between the surfaces of the peritoneum lying in contact with each other, there is a possibility of the patient's recovery, by the use of such remedies as usually favor a disintegration and removal of inflammatory products, and a careful support of the nutrition of the patient. The inflammatory products existing in the case may be removed by absorption, nutrition remaining active, no new accumulations take place, and the patient remains well. Quite as frequently, however, even in these cases, the patient does not make a permanent recovery.

Remedies for a time lessen the amount of serous accumulation, render the patient much more comfortable, but on the recurrence of every excess of exercise, exposure, or accident that is calculated to disturb the abdominal cavity the symptoms are renewed, new accumulations take place until the peritoneal membrane becomes permanently indurated; constituting substantially a sclerosis or hypertrophy of the connective tissue entering into it—in which condition a continuance of the process of exudation sufficient to renew the serous accumulations within a few weeks has occurred, every time they are evacuated either by aspiration or tapping. And yet such patients will occasionally live for many years. I have one still in the wards of the hospital; a woman about forty, or between forty and forty-five years of age, who was admitted to the hospital about sixteen years since. At the time of her admission, the abdomen was enormously distended by a serous accumulation. It had been allowed to go on increasing until the umbilical region had given way, and a large umbilical, hernial protrusion had taken place. The patient was not much emaciated; had little or no general febrile symptoms or increased heat, but was suffering extremely from the crowding of the diaphragm upwards, and from the great weight of the abdomen. Being unable to get a very accurate history of the case, and the dropsy being entirely circumscribed or limited to the abdominal cavity, with no œdematous infiltration into the feet, ankles or any other part, I was lead to suppose that it originated from some disease of the liver; most likely the early stage of cirrhosis. But for temporary relief, I introduced an ordinary trochar through the abdominal walls, withdrew the stylet and drew off through the canula two large wooden pails full of a very heavy thick or serous fluid only slightly turbid. When the abdomen was empty I could detect no evidence of any tumor in any part of it, certainly no evidence of enlargement of the liver or spleen, neither was there indication of any considerable contraction of the liver as in cirrhosis. There was slight tenderness on deep pressure, as by pressing toward the back parts of the abdomen against the meso-colon, but it was by no means strongly marked. The reaccumulation of fluid was slow, but at the end of six months, it had again become sufficient to be very troublesome to the patient, and again we resorted to tapping. She has remained in the hospital requiring to be tapped pretty regularly twice a year, the shortest interval being five months, the longest seven between the tappings, until she has now had thirty-four tappings, during a period of sixteen or seventeen

years. The only changes that have taken place are a little increased paleness, from diminution of the red corpuscles of the blood, and progressively increased dryness and harshness of the cutaneous surface, the urine is almost constantly scant, and there has been a steadily increased thickening of the membrane lining the abdominal walls and of the parts constituting the mesentery, as readily determined by examinations each time after the withdrawal of the fluid. And yet the patient is now in sufficient health to render it probable that she will yet require several more tappings before reaching a fatal degree of exhaustion. In only one instance was fluid withdrawn tinged with blood, and that was occasioned by the patient's having a fall, which caused a severe contusion of the distended abdomen about two weeks before tapping. It would seem in this case that the patient had been attacked primarily with a moderate chronic peritoneal inflammation, more particularly of that part of it which enters into the formation of the mesentery and meso-colon which has resulted in thickening and hypertrophy of the membrane, and a persistent exudation of serum. But in no part of her long stay in the hospital has she exhibited any marked febrile symptoms or any other indications of disease of an inflammatory character.

Treatment.—Having mentioned the chief diagnostic symptoms of the different stages and varieties of chronic peritonitis, I shall pass directly to the treatment. This, in almost all the cases, must be palliative. When the disease has originated without connection with any general constitutional diathesis or local developments of a tuberculous or cancerous nature, benefit may often be derived from the internal administration of diuretics in connection with iodine alterants; more especially a combination of iodide of potassium with digitalis. If the patient suffers pain or much soreness, conium or hyoscyamus or belladonna may be added to the iodide and digitalis; and long continued moderate counter-irritation may be kept up over the surface of the abdomen. Occasionally in these cases temporary exacerbations indicating increase of local inflammation in some particular portions of the abdomen will occur, and I have seen the application of a blister under such circumstances productive apparently of decided good effects. But more generally instead of blistering, which to be effectual must be repeated, thereby incurring the risk of having the cantharides irritate the neck of the bladder, it is better to rely upon such applications as will produce decided stimulation of the surface without actually vesicating. A liniment composed of two or three parts of camphorated soap liniment, and one of the tincture of iodine may be used, by applying it over the whole abdominal surface morning and evening. When the inflammation is more circumscribed or limited to some particular part of the abdomen, and is not complicated with any constitutional diathesis, advantage may be derived from the use for a limited time, before the application of soap and iodine liniment, of a mercurial preparation, particularly of the oleate of mercury. But this must be used with sufficient caution not to allow the amount absorbed to produce constitutional effects or soreness of the mouth. It will be more advantageous to use it only for a few days first, and then follow it with iodine diluted with camphorated soap liniment. By thus using diuretics, mild alterants and anodynes internally with counter-irritation of a moderate character externally, and persisting in their use for a considerable length of time, the progress of some cases may be arrested, the effusion that had taken place reabsorbed, and recovery produced. Where this does not result, the same treatment will retard the progress and alleviate the symptoms

of the patient, and perhaps postpone the time when further measures must be adopted to relieve the abdominal distension. When, however, the latter occurs to such an extent as to seriously embarrass other functions, and is not readily reduced by such measures as I have indicated, instead of resorting, as is sometimes done to hydragogue cathartics, and thereby impairing the digestive organs, and yet getting only a temporary and moderate degree of relief from the serous accumulation in the abdomen, it is better to proceed to aspirate where the fluid is found to be only serous, and repeat the aspiration just as often as the abdomen becomes sufficiently distended to crowd upon the diaphragm. It is not well to repeat it oftener; indeed the aspirations or tappings should not be made as long as the patient can be comfortable, or can maintain the respiratory function without serious embarrassment, because every removal of two, three, or four gallons of serous fluid allows the exudation to proceed more rapidly, and in consequence more rapidly exhausts the blood of its albumen as well as saline and watery elements, and correspondingly reduces the patient.

When by aspiration it is found that the fluid in the abdominal cavity is pus, there is little hope, even of obtaining much temporary relief, or materially retarding the progress of the case. And the question whether the patient shall be rendered as comfortable as possible by palliatives, and the disease allowed to progress without any operative procedure, or whether the pus shall be removed by tapping with a large trochar, to which a Davidson's syringe is attached, and the abdominal cavity washed out cautiously, with artiseptic washes, and have drainage established as in cases of suppurative pleuritis, should be fairly considered by the practitioner, and his decision should rest much upon the disposition of the patient, coupled with the degree of actual impairment of respiration and discomfort arising therefrom. Many of the patients become extremely anxious when suffering from dyspnœa, inability to lie down, and are worn out by the limited amount of rest they get, and should be afforded some relief, even if it be of a very temporary character. Under such circumstances the withdrawal of the pus by either of the methods I have indicated would be justifiable and proper. I have purposely in this lecture said nothing in regard to the diagnosis, or differentiation, of ascites dependent upon the different forms of peritoneal inflammation, from the ovarian cysts and other abdominal tumors, for the reason that the symptoms and measures relied upon for such diagnosis are given in more detail, and can be better appreciated when discussing the diseases from which the peritoneal inflammation is to be distinguished, than before such diseases have been brought under review.

LECTURE LVI.

Hepatitis—Its Varieties, Clinical History, Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: True inflammatory affections of the liver are less frequent in temperate and cold climates than the same forms of disease affecting different portions of the alimentary canal. In warm climates the liver is much more frequently involved in inflammation. When

affected, the inflammation may be limited to the parenchyma and secreting cells mainly, or it may be restricted more to the connective tissue, especially that part of the connective tissue belonging to the capsule of Glisson, and its ramifications through the organ. The whole organ may be invaded, or the disease may be limited to particular portions of it—as to the convex surface, or to the right or left lobes separately. The inflammation may vary in its grade of activity from the most violent and rapidly progressive to the slightest and most chronic form of inflammatory action. For convenience, we shall consider the inflammations under the general divisions of acute and chronic. In giving the clinical history I shall consider the acute cases under the heads of, simple parenchymatous inflammation, circumscribed suppurative inflammation, and acute yellow atrophy. The chronic forms of inflammation I will consider under the names of chronic parenchymatous inflammation, which is most generally the sequel of acute attacks, and chronic interstitial inflammation more frequently originating, without being preceded by acute disease, and leading to such changes as are generally designated under the head of sclerosis or cirrhosis.

Simple Parenchymatous Hepatitis.—As I have stated, most of the cases that have been met with in practice, and described by writers, of this form of inflammation, occur in hot climates. Occasionally they are met with in all climates, and especially during the warm seasons of the year in malarious districts. Very rarely instances occur as the result of sudden exposure to cold and wet, during warm seasons of the year, where no malarious influences exist.

Symptoms.—The symptoms which characterize an attack of simple parenchymatous hepatitis vary much with the severity of the attack. In cases of moderate severity, the disease supervenes suddenly, with some degree of chilliness, which is of brief duration, however, and accompanied by a sense of heaviness and pain in the right hypochondriac region. The character of the pain will vary according to the part of the liver most involved. If the disease is confined strictly to the parenchyma of the organ, the pain will usually be of a steady, dull, heavy character, generally increased by taking a full inspiration, or by any motion by which the diaphragm is depressed, and the side put upon the stretch. It is also accompanied by more or less direct tenderness both to pressure over the region affected, and particularly to percussion. The pain is also usually increased by turning upon the left side in the recumbent position, associated with a sense of dragging, or weight, and oftentimes also by a sense of nausea, and inclination to vomit. If the inflammation extends to the convex surface of the liver, involving the peritoneal covering, the pain will be much more acute, often resembling the sharp, lancinating pains of pleurisy, and aggravated in the same manner by the respiratory movements. In such cases also the pain sometimes extends backward under the right scapula and upward to the shoulder. The breathing is usually shorter, being stifled to avoid the sharp pains. The pulse is frequent, moderately full and firm under the finger, the skin dry, the face moderately flushed, the temperature of the body increased two or three degrees above the natural standard. Generally there is a thin whitish coat upon the tongue, more or less dryness of the mouth, frequently a heavy, dull pain through the forehead and temples, accompanied by dizziness upon taking the upright position; and after the first two days very generally some degree of yellowness of the conjunctiva of the eye; a deep brownish red color of the urine, which is less in quantity than natural, and in most instances a moderate constipation of the bowels.

If the right hypochondrium is examined by auscultation and percussion, the first will develop respiratory sounds throughout the whole depth of the chest above the diaphragm as usual, while the latter will indicate an increased area of dullness over the space occupied by the liver, associated directly with decided tenderness to the blows inflicted in the act of percussion. In most cases the enlargement of the liver will be such that its edge may be felt below the margin of the ribs, toward the right, and often it will extend further than usual into the epigastric region to the left. In most acute cases there is much disturbance of the functions of the stomach indicated by loss of appetite, frequent nausea and sometimes vomiting, especially when drink is taken in considerable quantities. The matter vomited at first may be freely intermixed with the coloring matter of bile, but at a later period is generally only the secretion of the stomach and the materials that have been taken as ingesta. In such cases as are occasionally met with in connection with attacks of malarious fever, and as I have seen, the result of direct exposure to wet and cold, the symptoms I have described have usually increased moderately in severity, during the first three or four days. But if modified by appropriate treatment, they usually pass their climax, with the close of the third day and begin to abate. The pain diminishes, the general febrile symptoms also diminish gradually, the tongue becomes more clean, the sense of fullness and weight in the right hypochondrium lessens from day to day, till at the end of from seven to ten days, convalescence has been established, and all the spmptoms, both of enlargement of the liver, and of functional disturbance have ceased. In a few instances, where the treatment had been neglected during the early stage, the disease has run a more protracted course; causing a much greater degree of enlargement of the liver, more general prostration of the patient, the pulse at the end of a week ranging from 110 to 120 beats per minute, being smaller and more easily compressed. The skin and eyes become deeply yellow, the coating upon the tongue more brown and dry in the middle; the bowels more or less constipated, the urinary secretion decidedly scanty and very deeply tinged with the coloring matter of bile. In two or three cases, such as I have now referred to, the acute stage of the disease gradually declined, with an amelioration of the more active symptoms, such as fever, pain in the side, and quick pulse, and yet the liver remained much enlarged, jutting from one to two inches below the margin of the ribs, through the whole extent of the hypochondriac region; it was moderately tender to percussion, and there was a continuance of the sense of weight, heaviness and more or less pain, on taking deep inspirations, or on any free motion of the affected side. These were cases in which the acute form of disease terminated in the establishment of a well marked chronic inflammation, accompanied by enlargement and induration of the substance of the liver. In three of the cases coming under my own observation, the hepatic enlargement and induration continued from two to three months, subsiding very slowly, but ending in the ultimate recovery of the patient. In the fourth case, after having continued in the chronic form, with much enlargement of the liver for nearly three months, suppuration took place, indicated by the occurrence of irregular chills, copious sweats, increased rapidity of pulse and emaciation, and a well marked increased swelling in the right portion of the hypochondriac region corresponding with the convex portion of the right lobe of the liver. In this case a large abscess approached the surface near enough to give distinct fluctuation between the eighth and ninth ribs a little forward of their angles. Although the abscess was opened and discharged its contents, leading to a temporary improvement

of the patient, the subsequent occurrence of hectic symptoms and progressive emaciation terminated the case fatally at the end of six months In hot climates, acute parenchymatous inflammation gives rise to the occurrence of the same class of symptoms as I have described, but they are usually more violent; the fever is of a higher character, often accompanied by delirium, there is a very much more scanty condition of urine, and earlier jaundice or a yellow hue of skin and eyes; frequently severe vomiting, rapid enlargement of the liver, which occupies and bulges the hypochondriac space, crowding upon the parts below and in the epigastrium, and not infrequently terminating fatally in from five to seven days. It is in such climates, and in this acute form of the disease, that it manifests a more decided tendency to suppuration, and the formation of one or more abcesses, if the patient survives beyond the first week from the beginning of the attack. The supervention of suppuration in the acute form of the disease is usually indicated by the development of chills, followed by profuse sweats, a more rapid pulse and more rapid emaciation, loss of strength; and often also by the almost entire suppression of urine, accompanied by delirium and coma, a little preceding the fatal termination.

The form of the disease, which has been termed acute yellow atrophy of the liver, I have classed among the acute inflammations, though well aware that many writers doubt its inflammatory character. It is of very rare occurrence in temperate and cold climates. It is not of frequent occurrence in any climate, but cases occur much more frequently within the tropics and in the warmer latitudes than elsewhere. Its symptoms are usually developed rapidly, though oftentimes in a manner to render the diagnosis extremely obscure. The patients are generally seized with more or less chilliness, speedily followed by an increase of heat and rapid pulse, though this oftentimes varies much in the same patient, being sometimes 120 to 130 in the minute, at others falling as low as 70 or 80. The respiratory movements are hurried and irregular. There are severe pains in the head, with frequent turns of delirium, or high excitement and occasionally severe vomiting. The bowels at times are costive and at other times loose, but there is seldom any evidence of the coloring matter of bile either in the matters ejected by vomiting or passed through the bowels. The urine from the beginning is very scanty and high colored, containing much less than the natural proportion of urea, and not infrequently an excess of both leucin and tyrosin. The skin and eyes also become deeply yellow, almost from the commencement of the disease. In the very violent cases, during the second and third days, petechial spots make their appearance in different parts of the cutaneous surface, and not infrequently hemorrhages either from the mouth and gums, or from the stomach by vomiting, and sometimes blood passes the bowels, or is mixed with the urine. Most of these cases terminate fatally in from three to seven days. The symptoms referable to the right hypochondriac region are very variable. Generally in the commencement there is acute pain, a sense of heaviness in that region increased by motion of the diaphragm, but there is seldom any indications of enlargement of the liver. While percussion will afford evidence of tenderness over the hypochondriac region, sometimes very acute, at other times very moderate, there is no increased area of dullness, but on the contrary, after the first two days, the liver appears to occupy less space than natural. This absence of any indications of enlargement of the liver, the variableness of the pain referable to that region, coupled with the very early delirium, violent vomiting, great functional disturbance of the kidneys, would be likely to divert the attention of the practi-

tioner from the liver as the seat of disease altogether, were it not for the coincident and early supervention of yellowness of the skin and eyes, and the presence of the coloring matter of bile in the urinary secretion.

Anatomical Changes.—The anatomical changes which take place during the progress of acute inflammation in the liver are similar in kind to those which result from inflammatory processes in any other tissue of the body. There is in all cases intense injection of the blood vessels, thereby increasing the fullness of the organ and rendering the color more red, but as the cases of simple inflammation progress, exudation takes place into the interstitial spaces of the tissue, leucocytes or white corpuscles are found permeating the vessels or outside of the vessel wal's, and lymphoid and spindle shaped cells are found multiplying rapidly. There is also more or less obstruction of the smaller vessels in the inflamed parts. In acute cases, the surface of the liver is variable in color, some portions of it being deep red, others of a more decidedly yellow hue. In cases that have terminated fatally during the active stage of the disease, the texture of the liver is generally softer than natural. If suppuration has taken place, the pus will generally be found to have collected into one or more abscesses, instead of being diffused through the parenchyma of the organ. The walls of the abscesses will usually be denser and firmer from the increase of connective tissue. The changes which result in that variety of disease known as acute yellow atrophy, consist in a rapid disintegration and apparent disappearance of the secreting cells of the liver, causing a diminution in the number of them wherever the structure is examined. In place of the secreting cells throughout the lobules of the liver, there is found by microscopic examination aggregations of dark bile pigments, fatty matter and masses of hæmatin. It is this rapid disappearance of the secreting structure, and its replacement with the constituents just mentioned, that apparently causes the rapid atrophy of the organ; it frequently being less than half its natural size, and of a more flattened form. Its color is also changed to a more decidedly yellow hue, more nearly that of the rhubarb root. The connective tissue maintains very nearly its natural integrity, and in some places appears to have increased by hypertrophy or sclerosis. Many of the branches of the portal veins are obstructed or obliterated, while those of the hepatic artery are found dilated and enlarged, and those of the hepatic veins nearly natural. These anatomical changes have caused some pathologists to regard the disease as not inflammatory in its character, but acute fatty degeneration of the organ, resulting either from some morbid condition of the blood or from the direct infection by bacterial germs. In nearly all the cases that have been examined of this form of disease, the kidneys have been found coincidently to have undergone much degeneration of structure causing an almost entire suspension of their secretory function. The blood itself has been found to contain a large proportion of cholestrine and of the coloring material of the bile, and in some instances also an excess of urea. This would lead to the suspicion that the functions both of the liver and kidneys are early suspended, allowing the fatty constituents of the bile to rapidly accumulate in the blood. And it is undoubtedly this rapid accumulation of the excretory elements operating as poisons upon the nervous centers, that produces most of the prominent symptoms and phenomena of the disease during its whole progress, and which leads in almost all instances to an early fatal result.

Diagnosis.—Acute hepatitis, whether mild or severe, is generally accompanied by symptoms so well marked as to leave no difficulty in forming an accurate diagnosis. The chief diseases with which acute hepatitis

may be confounded are—acute pleuritic inflammation in the right side of the chest, acute rheumatism located in the diaphragm and lower intercostal muscles, and neuralgic pains in the same parts. When inflammation affects the convex surface of the liver, the general symptoms, so far as they relate to acuteness of pain, interference with respiration, increased frequency of pulse and general fever, are closely analogous to pleuritis; but are easily differentiated by physical examination. In the pleuritic affection, auscultation in the first stage readily reveals friction sound, and in the second stage with disappearance of the friction sound, we have dullness on percussion, with a removal of the ordinary respiratory murmurs over the lower part of that side of the chest. While in hepatitis of any grade or degree of severity the respiratory sounds continue natural throughout the whole depth of the chest, yielding neither friction in the beginning, nor absence of respiratory murmur with dullness on percussion at any subsequent stage. But while auscultation and percussion thus furnish no evidence of change in the chest above the diaphragm, in hepatitis the percussion below the diaphragm shows both acute tenderness and increase of dullness, extending downward and to the left, thereby clearly showing that the disease is below the diaphragm, and involves an enlargement of the liver instead of any changes in the chest, as would be the case in either pleurisy or pneumonia. I have seen many cases of subacute rheumatism, affecting the diaphragm and intercostal muscles that have been mistaken for hepatitis. As the pain of rheumatism is dull and continuous, very much like that affecting the parenchyma and deeper portions of the liver, and may give rise to the same tenderness on percussion over the part, there is necessity for careful examination to prevent mistakes in such cases. In the rheumatic affections you get no friction or alteration of sound by percussion or auscultation above the diaphragm. But there is this clear line of distinction between the rheumatic affection and hepatitis. The former is never accompanied by any increased area of dullness in the right hypochondriac region, neither is it accompanied by the peculiarly dark hued urine occasioned by the intermixture of the coloring matter of bile, nor by yellowness of the skin or eyes; while hepatitis, especially of an acute character, is accompanied from a very early period after the symptoms commence by not only an increased area of dullness on percussion and by such enlargement as enables the margin of the liver to be felt below the ribs, causing heaviness and dragging sensations on turning to either side, but also very uniformly by a characteristic alteration in the color of the urine as well as of the skin and conjunctiva of the eye. From all forms of neuralgia acute hepatitis is distinguished by the presence of tenderness, fullness of the hypochondriac space and more or less general febrile movements, as well as alterations in the color of the skin, eyes and urine, all of which symptoms are absent in the neuralgic affections. In addition to the diagnosis of hepatitis from other affections, it is often important to note such diagnostic symptoms as indicate the commencement of suppuration. These, as I have already mentioned when speaking of the clinical progress of the disease, are usually the sudden occurrence of a chill, followed almost invariably by sweating, and a decided increase in the frequency of the pulse, with diminution of its volume and force. The recurrence of chills and sweats at irregular intervals, with increased rapidity of emaciation and increased frequency and diminished force of the pulse, accompanied by evidences of more rapid enlargement in some one direction in the hypochondriac region, will justify the conclusion that suppuration has taken place. The diagnostic symptoms of acute yellow atrophy of the

liver are the coincident and rapid development of yellowness of the skin and eyes, and marked diminution of the urinary secretion and its change to a brownish yellow color from intermixture of bile pigments and deficiency of urea, with violent disturbances of the cerebral functions, rapid deterioration of the blood, as indicated by extreme depression, with tendency to hæmorrhages, either in the form of petechial spots upon the surface or hæmorrhages from the mucous membrane, associated with vomiting and diarrhœa, without any coincident enlargement of the hypochondriac region, but rather with rapid diminution in the area of dullness.

Prognosis.—The prognosis in ordinary simple acute inflammation of the liver in temperate climates is generally favorable. In warm climates the prognosis is more grave, the disease having much more tendency to develop rapid structural changes, either in the direction of softening, acute fatty degeneration or suppuration, and consequently a much larger number terminate fatally. The special form known as acute yellow atrophy is extremely dangerous, terminating fatally in almost all the cases in which the diagnosis has been made with any degree of certainty. This form of disease is of such rare occurrence in this climate that I have no recollection of meeting with more than two cases that could be justly placed under this head. Both of these were visited in consultation with other physicians, and were in the advanced stage of the disease. One of them vomited blood copiously, and both terminated fatally within the first five days after the commencement of the attack. Both of these cases were females; and it would appear from statistics which have been gathered that females are more subject to this form of the disease than males, and that it is more liable to occur during the state of pregnancy than during any other time. Much the larger number of cases have occurred between the ages of fifteen and thirty years.

Treatment.—In mild cases of acute inflammation of the liver, such as are occasionally met with in connection with sudden exposure to cold and damp, and with attacks of malarious fevers, it is generally sufficient to confine patients to rest in the recumbent position, administer some mild evacuants, and the pain and soreness rapidly disappear. Perhaps the best evacuants for this purpose, consist of from two to three decigrams (gr. iii to v) of calomel, followed in about three hours by a saline laxative sufficient to procure a free movement of the bowels. If the case is connected with malarious influence there may be given directly with the mercurial, three decigrams (gr. v) of quinine, and after the bowels have been moved freely, the quinine may be continued in the same doses, three times a day for three or four subsequent days. If the sense of fullness and tenderness in the hypochondriac region proves to be persistent, a blister may be placed on that side, and internally the patient may be given from four to six decigrams (gr. vi to x) of the muriate of ammonium three times a day in solution with syrup of licorice. In the more severe cases, such as are met with frequently in warm climates, if the attack has supervened suddenly, and the patient has not been previously debilitated by ill health or age, it will often be advantageous to commence the treatment immediately after the onset of the inflammation by one free venesection. If the relief is not satisfactory, the bleeding may be followed in eighteen or twenty-four hours, by the application of eight or ten leeches over the hypochondriac region; and both before and after the application of leeches during the first two days, the whole side may be kept covered with narcotic fomentations. Internally, immediately following the bleeding, where this is deemed advisable, it is better to give the patient a powder, consisting of six decigrams (gr. x) of bi-carbonate

of sodium and six centigrams (gr. i) of the mild chloride of mercury every three hours, until three or four of these doses have been taken. If they do not result in a direct operation upon the bowels, they should be followed by sufficient rochelle salts, or citrate of magnesium to procure a free operation. Following the free movement of the bowels, the patient may be put directly upon the use of the muriate of ammonium, in the same doses I have previously mentioned, but instead of three times a day, it should be given once in three or four hours; and if the patient continues to suffer from much acute pain or a sense of soreness, there may be added sufficient morphine to the solution of muriate of ammonium, to give it a moderately anodyne influence. If the skin is hot and dry it will also add to the efficiency of the treatment if the tartrate of antimonium and potassium is added to the same solution in such proportion that the patient will get from fifteen to twenty milligrams (gr. $\frac{1}{4}$ to $\frac{1}{3}$) in each dose. In acute inflammatory affections of the liver, where it is not complicated with irritation of the gastric mucous membrane, I have derived the most satisfactory results from the use of a combination of muriate of ammonium, tartrate of antimonium and potassium, with sulphate of morphia, dissolved in syrup of licorice, commenced immediately after the first free opening of the bowels, in the early stage of the disease. In some cases under treatment, the general fever diminishes, the acute pain disappears, but there remains a sense of fullness, weight and tenderness, with evident enlargement of the area of dullness over the hepatic region, thereby showing a disposition to persist and perhaps to assume a chronic form. Counter-irritation by blistering will be of much value at that stage, with continuance of such doses of the muriate of ammonium as the stomach will best tolerate. But in those very rapid and severe attacks, where after the first two or three days chilliness supervenes, and the phenomena indicate the existence of suppuration, no treatment usually produces much modification in the symptoms until suppuration has advanced sufficiently to allow of either an artificial or spontaneous discharge of the matter. As the tendency to spontaneous discharge is usually either directly into the peritoneum, or through adhesions into the colon, or sometimes into the stomach, or at other times upward through the diaphragm into the lungs, or through the walls of the abdomen to the exterior, all of which involve a slow, tedious process, and more or less ultimate danger to the patient's life, it is very desirable to prevent such spontaneous discharges of the pus by an early resort to aspiration, and if need be to a sufficiently free opening to admit of a complete drainage of the abscess. The greater number of cases of suppuration in the liver progress forward and downward as if tending to approach the surface just upon the lower right margin of the epigastric region. The next most frequent tendency is in the direction of the posterior part of the hypochondriac space usually between the eighth and ninth ribs. Whenever the results of physical exploration by palpation and percussion, corroborated by the general symptoms of the patient, are sufficiently characteristic to justify a confident opinion that an abscess has formed, you may feel justified in making an exploratory puncture with the aspirator needle, thereby demonstrating whether pus exists, and can be reached or not. It has been recommended by very high authority that in such cases, a free incision be made over the most prominent part of the swelling, through the textures, down to within a few lines of the peritoneum, not puncturing the peritoneum nor puncturing the abscess, but carrying the incision two or three inches in length down close to the peritoneum, filling it with cotton, and leaving it for two or three days, during which more or less suppuration takes

place accompanied by adhesive inflammation in the adjacent textures, thus making sure of the adhesion of the peritoneum to the surface of the liver, and in most instances of a rapid advance of the abscess to spontaneous discharge from the bottom of the incision.

In cases where matter is found, and it is too thick, as sometimes happens, to flow freely through the ordinary aspirator tube, it can be much more freely and completely evacuated by using a small trochar fitted to a Davidson's syringe in place of the aspirator needle. If the abscess refills, after it has been aspirated two or three times, and consequently you have reason to suppose that there are certainly adhesions between the peritoneal surfaces, leaving no danger of matter passing into the abdominal cavity, the opening can be enlarged sufficiently to give free exit to the matter, and drainage can be established with ordinary antiseptic precautions. Abscesses in the liver, whether resulting from acute or chronic inflammation always involve more or less danger; yet where they can be evacuated judiciously in the manner I have indicated, the larger proportion of them will recover. Of six cases that have fallen under my own care, as I now remember, four recovered, two were relieved, and continued for several months, but ultimately died from exhaustion in consequence of continued suppuration.

Chronic Hepatitis.—Chronic inflammation of the liver is met with in practice under two forms. The first is the sequel of more acute, general attacks of hepatitis, and is characterized by the physical signs of enlargement of the liver, such as increased area of dullness on percussion, ability to trace the edge of the liver below the margin of the ribs, a constant feeling of weight, increased to a dragging sensation when the patient turns on the opposite side, very generally a dull pain in the hypochondriac region which not infrequently extends to the back under the scapula, sometimes to the shoulder, an acceleration of pulse, a slight febrile movement in the afternoon and evening, a gradual loss of flesh and strength, and most generally a loss of appetite and some degree of derangement in the digestion of what food is taken. In a majority of instances the skin and eyes are more or less tinged a yellow color; sometimes deeply so, at other times only slightly. After the disease has continued some few weeks, dropsical symptoms very generally supervene; sometimes a slightly œdematous condition of the tops of the feet, about the malleoli of the ankles when the patient is sitting up, will be observed for several days before any other noticeable, dropsical feature; but more generally no symptoms of œdema are seen in the areolar tissue, either of the face or extremities. Very generally, however, the patient finds in addition to the ordinary fullness of the right hypochondriac region that the lower part of the abdomen also begins to be more prominent and heavy than natural. At the same time the urinary secretion is more scanty, and also tinged with the coloring matter of bile. The fullness in the lower part of the abdomen is not usually accompanied by pain or any ill feeling other than that of weight, and it increases slowly from day to day, till at the end of from five to six weeks there will be considerable distension of the peritoneal cavity, and in proportion as this distension increases the patient suffers much from a sense of heaviness and oppression whenever he takes food, and sometimes is provoked to reject it by vomiting. If the abdomen is examined at any time there will be no difficulty in detecting distinct fluctuation of fluid. The fluctuation becomes more and more distinct as the accumulation increases. If no measures are taken for the relief of the patient, he will arrive at a stage of distension from the accumulation of serous fluid in the cavity of the peritoneum, such as to compress the stomach, thus preventing the reception

and digestion of food; to crowd the diaphragm upward sufficiently to very much impede the process of respiration, thereby causing blueness of the lips, coldness of the extremities, extreme feebleness of the pulse, drowsiness and yet inability to sleep. And if not interfered with, the mind becomes incoherent, the urine nearly suppressed, and finally coma and death supervene.

Thus far I have spoken simply of chronic hepatitis, as it is occasionally met with, resulting from prior acute or subacute attacks. We occasionally meet with cases in practice in which the liver is attacked with chronic inflammation, very circumscribed in extent and almost always secondary to or as a complication of other affections. Chronic dysentery especially, is every now and then complicated with circumscribed inflammation of the liver, accompanied by very obscure symptoms, until suppuration has supervened, when there develops in a few weeks, all the phenomena of a hepatic abscess. Similar results take place sometimes during the progress of chronic inflammation in any part of the alimentary canal. And they are occasionally met with during convalescence from general fevers, especially those of a typhoid and typhus character. Another form of chronic hepatitis, which is more common than those to which I have already alluded, is properly styled interstitial inflammation. It occurs almost exclusively in adults or persons between the ages of fifteen and fifty years who are addicted more or less to the use of alcoholic drinks. Some eminent writers claim that it occurs only from the use of whisky, gin, brandy or the more concentrated alcoholic beverages. I am not satisfied, however, that it is limited exclusively to those who use such drinks. I think I have seen a few very well marked cases of this form of disease, in patients who had certainly not used any form of alcoholic drink. Such cases are exceedingly rare, however, while they are very common in those who have habitually used this class of beverages. The disease to which I am now alluding is more generally termed cirrhosis of the liver. It is much more proper, however, to designate it sclerosis, because cirrhosis has reference to yellow color and the patients are by no means always jaundiced or yellow. Neither is the liver itself always of a yellow hue, consequently, the name cirrhosis is not strictly applicable to all cases; while sclerosis, which relates directly to the pathological changes in the connective tissue of the liver, has reference to a constant element in the pathology of the disease. The symptoms which characterize the commencement of this form of hepatitis are obscure, and very often either escape altogether the attention of the practitioner, or are misinterpreted, till the disease has so far progressed as to cause the beginning of dropsical effusion. Whenever an opportunity has been afforded to study the clinical history of this class of cases, I have found, among the earliest symptoms, obscure pain extending from the center of the epigastrium to the right, through nearly the whole right hypochondrium; better described as a dull, heavy sensation than anything like acute pain. Percussion, however, over any part of the hypochondriac region, and into the right margin of the epigastric, pretty uniformly caused increase of soreness, and sometimes the sensation of nausea. The soreness was also increased by any kind of motion which put the side on the stretch. The tongue was covered with a yellow thin coat, especially over the middle and back part. There was loss of appetite, slight acceleration of pulse, very little increase of temperature. In some cases there was also frontal pain, moderate constipation of the bowels, high-colored and scanty urine, and occasionally, slight yellowness of the conjunctiva, but seldom any general jaundice or noticeable yellowness of the whole surface.

If food was taken, even in small quantities, there was pretty uniformly defective digestion accompanied by eructations of gases and sometimes acids. These symptoms usually continued for about one week, when under mild treatment they were relieved. Nearly all the symptoms disappear during the second week, and the patients claim to be very well except a lack of the usual strength or power of endurance and the continuance of some obscure defect in the digestion of food.

In most cases, these symptoms will be so slight that the patient thinks he requires no further medical attendance. But at the end of three or four weeks he finds himself weaker, tiring easily, with a little increase of indigestion, gaseous eructations after taking food, with unusual fullness of the abdomen. The latter continuing to increase, he again calls upon his physician, who on examination finds him pale from deficiency of red corpuscles in the blood, with a soft, easily compressible pulse which is a little increased in frequency, but with no general fever. Sometimes the conjunctiva shows a tinge of yellow, but the most prominent feature of the case is considerable enlargement of the abdomen. On examination by palpation and percussion, this enlargement is found to consist of an accumulation of fluid in the cavity of the peritoneum. Occasionally, if examination is made very closely, at this stage, in addition to the distension of the peritoneal cavity with serous effusion, traces of moderate enlargement of the liver may still be found. In many instances, however, no trace of enlargement can be found; but on the contrary the line of intestinal resonance produced by the transverse colon will be found fairly above the margin of the ribs, showing that the liver has receded by a lessening of its size rather than otherwise. From this time the symptoms in these cases are pretty uniform. The abdomen becomes more and more distended with serous fluid, the patient becomes more pale, anæmic, less able to be on his feet and get about, and from the mechanical pressure in the peritoneal cavity backwards upon the renal vessels, upward against the diaphragm and stomach, respiration, digestion and the renal secretion are all more or less interfered with. Consequently the patient loses strength pretty rapidly, and in a few weeks is reduced to the alternative of having the fluid removed from the cavity of the abdomen by some means, or of suffering fatal interference with the respiratory and digestive functions, or as occasionally happens in such cases, from such a degree of suppression of the urine as to produce uræmic poisoning, convulsions, coma and death.

Anatomical Changes.—The anatomical changes which take place in the progress of this variety of chronic hepatitis, are the result of a slow inflammatory process, apparently established primarily in the connective tissue, constituting the capsule of Glisson and its ramifications through the structure of the liver surrounding individual lobules and secreting cells. The morbid excitability, and increased vascularity of this tissue constituting the inflammation, causes an increase of cell proliferation making the lymphoid and spindle cells very abundant, and by their accumulation, sclerosis or hypertrophy of the connective tissue takes place, and by pressure directly on the thin walls of the branches of the portal vein, obstructing and even obliterating a large proportion of the smaller branches. At the same time, the hypertrophy of this tissue causes more or less atrophy of the secreting cells in the lobules, and in some instances their separation into rows, giving them, when examined under the microscope, much the appearance of biliary ducts studded with epithelium. The biliary ducts, however, and the ramifications of the hepatic arteries are not as much obstructed as the branches of the vena porta. The hy-

pertrophy of the connective tissue with atrophy of the secreting lobules results in a general contraction of the liver. The diminution of size is very unequal, giving it a nodulated appearance with rounded prominences on its surface which has given rise to the name "hobnail liver." The color is generally lighter or more yellow than natural. The size of the organ continues to diminish usually in proportion to the duration of the disease, until in some instances it is found less than one third the natural size. In a patient coming under my care, in whom the disease had existed for two years before reaching a fatal result, a post-mortem revealed the liver hardly larger or thicker than my hand. Post-mortem examinations also reveal in most instances, some traces of chronic inflammation in the mucous membrane of the stomach and duodenum, and in most cases the spleen is also found to have undergone some degree of chang , similar in its character to that which has taken place in the liver; and probably from the action of the same causes. The dropsical effusion which occurs very constantly in connection with this disease is limited almost entirely to the cavity of the peritoneum and results directly from obstruction of the portal vessels. When the abdomen is allowed to become very largely distended with effused fluid, the pressure upon the ascending vena cava and common iliacs, in the lower parts of the abdomen will sometimes so far obstruct the return of blood as to induce much œdema of the lower extremities and scrotum, but as a direct result of the disease of the liver, the dropsical effusion is limited almost entirely to the cavity of the peritoneum. I should remark, however, that the contraction of the liver as the result of sclerosis of the connective tissue has not invariably occurred. In some rare cases, the liver has continued to be its full size, or even larger than natural throughout the whole course of the disease. In such cases there is the same change in the connective tissue and more or less dropsical effusion, but the liver remains smooth upon its surface, although presenting a granular appearance. These cases have been regarded by some as a separate and distinct form of disease from that of sclerosis of the liver. Though arising evidently from the same causes, in the same class of patients, leading to similar results, and the anatomical changes which take place in the structure the same in all respects except the failure of the secreting lobules to undergo atrophy, and consequently there occurs no progressive diminution of the size of the organ.

Diagnosis.—There are no symptoms that can be said to be absolutely diagnostic of this form of disease in its early stage. Wherever in a patient accustomed to the habitual use of alcoholic drinks there is found distinct tenderness on percussion over the hepatic region, in addition to the other symptoms that I have before described, it is safe to assume that there is at least danger of developing this form of disease. The only absolute diagnosis, however, is based upon the physical signs of contraction of the liver, or its occupying less space than natural, coincident with evidences of commencing effusion in the cavity of the peritoneum.

Prognosis.—The prognosis in all cases of well established chronic inflammation of the liver, whether as the result of prior general acute attacks, or whether it be primarily chronic, of the interstitial form such as I have just been describing, is not favorable. There is much danger that the disease will persist until it shortens the life of the patient. Yet those cases which are the sequel of acute attacks, or arise from any cause not connected with sclerosis, if they have not been allowed to progress too far, and can be brought under judicious treatment, a reasonable expectation may be entertained of their ultimate recovery. So, too, if the interstitial form of the disease is actually diagnosticated early before the liver

has undergone marked changes in its structure, or before any dropsical effusions have occurred, there is also a reasonable chance of conducting the patient to a permanent recovery. But in all instances where changes have taken place to such an extent as to interfere with the portal circulation and induce the beginning of dropsical accumulation within the peritoneum, permanent recovery is a very rare occurrence. The work of the physician in such cases is limited almost exclusively to the palliation of symptoms and prolongation of life, with little or no probability of promoting a cure.

Treatment.—But few words need be added in regard to the treatment of chronic hepatitis. Such cases as come under the observation of the physician before the structural changes have gone sufficiently far to induce dropsical effusions, will be most efficiently treated by the use of mild saline laxatives to procure a moderately free movement of the bowels. If the urinary secretion is quite scanty, the patient may be at the same time put upon the use of an equal mixture of liquor ammonii acetatis and nitrous ether, in doses of four cubic centimeters (fl. ʒi) four times a day. If there be any quickness of pulse or slight fever, tincture of digitalis may be added to this mixture in such proportions as to give ten or twelve minims to each dose of the other ingredient. After the bowels have been moved, I have derived more advantage from the use of the following formula, in chronic inflammation with more or less induration and swelling of the liver, than from any other remedy or remedies that I have used·

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	Ammonii Muriatis	15.0 grams,	℥ss
	Hydrargyri Chloridi Corosivi	.1 "	gr. iss.
	Extracti Conii Fluidi	20.0 c.c.	ʒv
	Syrupi Glycyrrhizæ	145.0 "	℥ivss

Mix. Of this I have usually directed for adults four cubic centimeters (fl. ʒi) diluted with a little additional water, four times a day. Several cases were benefited by keeping up, during the first one or two weeks, a moderate degree of counter-irritation over the right hypochondriac region by the application of a mixture of croton oil, tincture of iodine and sulphuric ether which was painted over a moderate extent of surface morning and evening with a camel's hair pencil. Usually, in two or three days a moderate vesicular eruption is produced over the surface to which the mixture has been applied; and then by lightly touching it once a day, or once every alternate day, it may be kept at such a degree of soreness as is desirable, for one or two weeks. In most cases that are curable the internal alterants that I have mentioned coincident with external irritation has been sufficient to produce a slow but steady reduction of the inflammation and swelling until convalescence has been established. As the patient improves the number of doses in the day may be diminished; first, to three a day, subsequently to one morning and evening, until recovery has so far advanced as to allow of its discontinuance. While this treatment is being pursued, due attention should be given to the condition of the stomach and bowels; the latter being moved at least every alternate day, if they are not disposed to keep regular without the use of laxatives. If the kidneys need prompting, the same mixture that I have just mentioned as a diuretic will be sufficient for that purpose.

The patient's diet should be very simple, unstimulating; better if it can be made to consist largely of farinaceous articles and milk; no alcoholic

drinks of any kind, fermented or distilled, should be allowed in any of these cases. In the treatment of the first or early stage of interstitial hepatitis, more commonly called cirrhosis, before any dropsical effusions have taken place, the exhibition of one or two grains of blue mass, followed by a saline laxative, and subsequently by two or three doses each day of a solution of the muriate of ammonium, corrosive chloride of mercury and conium (see formula on preceding page), is a method of treatment which will be found perhaps more reliable and efficient than any other. To afford a chance of arresting them, however, it must be absolutely adopted early, before such changes have taken place as to cause any beginning of dropsical effusion. After such effusions have taken place I have never known treatment to result in anything further than a palliative influence. The great question for the practitioner after cirrhosis or sclerosis of the liver has advanced far enough to establish serous effusion into the cavity of the peritoneum, is by what method will he be enabled to retard the accumulation of serum and sustain the functions of digestion and assimilation most efficiently? The common practice is to endeavor to keep down effusion by resorting to diuretics and hydragogue cathartics. The first or milder class of diuretics, so long as they can be made to influence the urinary secretion, without deranging the stomach or destroying digestion, will be of much benefit to the patient. Hydragogue cathartics have ever in my own hands appeared to do the patient more harm than good. To produce an impression in reducing the amount of dropsical accumulation, the patient must be physiced, at least from three to four times in twenty-four hours, and the evacuations must be copious and watery. Less than this will make no impression, and yet I have never found a patient who could be kept under the influence of podophyllin or any other hydrogogue cathartic of sufficient activity to procure any number of evacuations, without at the same time producing inflammation in the mucous membrane, more than enough to offset the benefits gained in lessening the amount of dropsical effusion. Consequently I am satisfied, from long and abundant experience, that the use of hydragogue cathartics in these cases is not beneficial, and can seldom be resorted to without ultimate detriment to the patient. It is a much better rule to keep down the dropsical accumulation as far as practicable by the milder class of diuretics, and when these fail so that the accumulation and consequent distension begins seriously to inconvenience the respiration by crowding against the diaphragm, and equally to interrupt digestion by pressure upon the stomach, aspiration or direct tapping should be resorted to for the removal of the dropsical fluid, and followed by bandaging the abdomen, and by such diuretics as may be most beneficial, in increasing the renal secretion, and thereby retarding the dropsical reaccumulation. If the latter does occur, however, aspiration or tapping will again be much preferable to the depleting effects, or more properly the irritating effects of the hydragogue cathartics upon the mucous membrane of the alimentary canal. I am satisfied that my patients live much longer, and are much more comfortable, by a judicious repetition of the tapping, with mild tonics and diuretics internally, and a judicious regulation of the diet than by any other process I have been able to adopt. Of course as the cause of the dropsical effusion can not be removed, and as the reaccumulation generally takes place with an increased degree of rapidity as the case progresses, the blood eventually becomes so impoverished, that the patient's strength gives way, the tissues everywhere become imperfectly nourished, and he dies in a majority of instances from asthenia. And yet in a considerable number of cases the final termination is hastened or occurs somewhat suddenly by

perversion of the action of the kidneys, retention of the urine, poisoning of the nervous centers and the supervention of convulsions and coma; or coma and death without convulsions. Sometimes hemorrhages take place in the advanced stage, either from the stomach or bowels, leading to sudden and fatal results; and occasionally effusion takes place into the pericardium or into the cavity of the pleura, compressing the lungs or interfering directly with the action of the heart, and hastening the fatal result by either or both of these processes.

LECTURE LVII.

Splenitis—Acute and Chronic: Causes, Clinical History, Anatomical Changes, Diagnosis, Prognosis, Treatment; Nephritis—Causes, Diagnosis; Acute Nephritis—Symptoms, Anatomical Changes, Diagnosis.

GENTLEMEN: The spleen being an organ composed largely of connective tissue and blood vessels, admits of ready congestion, or engorgement and extreme changes in its circulation, without necessarily developing exudation, or true inflammatory action. And, perhaps, no one of the internal organs is more frequently involved in some degree of hyperæmia, with more or less irritation, sometimes extensive exudation and changes of structure, than is the spleen, during the progress of nearly all of the acute general diseases. As you have noticed, while I was speaking of the general fevers and directing your attention to the post-mortem appearances and pathological changes presented in both the periodical and continued types of fever, the indications of morbid action in the spleen were among the most frequent and noticeable of any in the cavity of the abdomen. While this is true in regard to those affections of the spleen which accompany general, acute or infectious diseases, it is equally true, that primary idiopathic inflammation of the spleen is one of the most rare occurrences that we meet with in general practice. Still it occasionally occurs, from general exposure to cold and wet as well as from congestions that occur during the active stage of other forms of disease. The inflammation may present all gradations of activity, from the most acute and rapidly progressive, to the more chronic and persistent form. When the spleen is attacked with acute inflammation, the symptoms are usually sufficiently characteristic to leave little or no doubt in regard to diagnosis. The organ being very distensible, the congestion of vessels necessarily constituting the first stage of the inflammatory process gives rise to a rapid enlargement of it, accompanied by more or less pain, dull and obscure, if the inflammation is restricted to the interior texture but more acute, sharp and lancinating if it invades the surface covered by the peritoneal membrane.

The pain, whether dull or acute, is located in the left hypochondriac region, oftentimes near the posterior hypochondrium, shooting upward occasionally toward the scapula, always increased on taking deep inspirations, or upon putting the side on the stretch, and still more increased by percussion and pressure directly over the region of the organ. Percussion not only produces decided indications of tenderness, but it also indicates an enlargement of the area of dullness beyond that which naturally belongs to the spleen in its healthy condition; and not infrequently

the enlargement is sufficient to enable you to touch the edge of the spleen projecting below the margin of the ribs on the left side by simple palpation. Acute inflammation of this organ is sometimes ushered in by chilliness, but more frequently without a noticeable chill, unless it is connected with coincident existence of malarious fever; but, whether there be chill or not at the beginning, it soon gives rise to a moderate grade of general fever, indicated by rise of two or three degrees of temperature, more or less acceleration in the frequency of the pulse and its fullness, more than the usual dryness of the skin, frequently some degree of coating upon the tongue, sympathetic nausea and not infrequently vomiting whenever drink is taken a little too freely. The symptoms thus developed in acute splenitis usually continue not more than from three to five days under favorable circumstances before they begin to abate. The soreness diminishes, the fever gradually disappears, and soon the enlargement is found to be diminishing, and at the end of the second week in most cases of simple attacks of inflammation, convalescence is established, and the organ returns to nearly its natural size. Such is not always the case, however, for sometimes after the acute symptoms have progressed for five or six days and the spleen has attained a size sufficient to jut two or three inches below the margin of the ribs, the pain begins to abate, the febrile symptoms diminish, and the patient becomes comparatively comfortable in all respects, except the swelling remains and there also remains a certain degree of tenderness to pressure, a sense of weight and heaviness in the side, scantiness of urine, a moderate acceleration of pulse, which is less firm and less full than at first, but still moderately increased in frequency, though easily compressed. Such a case may continue an indefinite period of time, the spleen gradually enlarging, until at the end of two or three months its lower end will rest upon the concavity of the ileum, or fill nearly the whole of the left side of the abdomen. These cases are said to have assumed the chronic form. I have seen some instances in which the spleen acquired a high degree of density, eventually becoming almost destitute of tenderness, but producing a progressive diminution of the red corpuscles of the blood and giving the patient a strongly marked spanæmic appearance, accompanied by a sense of weakness and inability to maintain active exertion.

There is still another class of cases, occurring chiefly in hot climates, in which the attack of inflammation is unusually acute and severe. The swelling and other symptoms progress rapidly for five or six days when the patient is attacked with irregular rigors and sweats accompanied by a small and rapid pulse, frequently, more or less delirum, and sometimes epistaxis. The patient loses strength rapidly, in some instances the bowels become loose, affording several thin, brown, or bloody evacuations in the twenty-four hours, and if no relief is obtained death may supervene from exhaustion or from the recurrence of copious hemorrhage either from the stomach or the bowels before the end of the second week. On the other hand some of these cases, after the recurrence of chills and sweats indicating suppuration and the formation of abscesses, in a few days discharge a large amount of pus by vomiting, showing that an abscess has formed in the spleen and discharged its contents into the stomach. I think some instances are on record in which adhesions had taken place between the spleen and extreme left angle of the colon, and abscesses have discharged from the spleen into that section of the colon, and, of course the matter made its appearance with the evacuation from the bowels. In still other instances, abscesses have tended to the surface and have formed adhesions with the abdominal walls, progressing in that direction till fluctuation was

distinguishable, and by either free incision, or by aspiration, the pus has been evacuated in the same manner as in abscesses of the liver. But suppuration as the result of inflammation in the spleen, is very much less frequent than in the liver—so much so that in the whole period of my practice I have met with not more than one or two instances that have been diagnosticated, either before or after death, as involving suppuration, or the formation of an abscess in the spleen. Acute inflammation in the spleen, whether resulting in suppuration or otherwise is more frequent in hot than in the colder climates.

The subacute attacks of inflammation in the spleen occur frequently during the progress of malarious fevers in all countries where such fevers are prevalent. Such attacks are usually of the milder type and supervene in connection with the chill belonging to the general disease, and are almost always so far relieved or modified by the treatment given to the general disease that they hardly require or receive separate consideration. And yet, from this very fact, there occur now and then cases which do not subside under such management, but only become modified by the subsidence of the pain, tenderness, and other more prominent symptoms, while the organ itself remains enlarged from congestion and exudation into its texture, and consequently is found in a few weeks or months, after the patient has been supposed to be convalescent, still giving rise to a sense of heaviness, weight, and sometimes dull pain in the left hypochondriac region accompanied by impairment of appetite, diminution of red blood corpuscles and continued sense of weakness. When examined the hypochondriac region on the left side is found more convex than natural, presenting a much larger area of dullness than belongs to the spleen, and its thick hardened edge is easily felt by palpation below the margin of the ribs from the left margin of the epigastric region around to the space between the crest of the ilium and lower ribs. These are cases in which the subacute inflammatory action established during the progress of acute general diseases only partially subsides, leaving the connective tissue of the spleen in a state of chronic inflammation with more or less exudation into the interstitial spaces of the tissue. Under continued hyperæmia, or chronic inflammatory action the work of sclerosis or hypertrophy of the connective tissue progresses. It is from neglect of the earlier stages of these cases, especially in malarious fever, and sometimes in the typhoid and typhus grades, that the patient is found, oftentimes months and sometimes years after convalescence from the general disease, with a chronic persistent enlargement and induration of the spleen. This may continue slowly to progress, till, as I have previously said, it fills up the whole of the left side, and by its mechanical pressure upon surrounding tissues gives rise to much discomfort and blood impoverishment, and ultimately shortens the life of the patient. In a few instances the inflammatory affection undoubtedly commences purely in the chronic form, without being preceded by either an acute or subacute attack.

In its early stage the symptoms are somewhat obscure, and often escape attention or lead to the suspicion that the patient is laboring under some gastric derangement or indigestion, till the organ has attained sufficient size and hardness to attract attention by its weight and fullness, and direct exploration by percussion and palpation, completes the diagnosis and renders the practitioner aware of the true cause of the patient's suffering.

Anatomical Changes.—The spleen when examined during the early stage of acute inflammation presents all the evidences of intense engorge-

ment of its vessels, the accumulation of blood causing an increased redness and swelling. When cut across, blood oozes from its vessels in greater quantities than is normal, and all the evidences of copious exudation into the interstitial tissue are present; the exudation being composed of numerous lymphoid cells, migrating corpuscles, more or less red corpuscles, fibrillated fibrine, and liquor sanguinis, produce varying degrees of density in the structure of the organ. In most cases where an acute inflammation has supervened as a complication of acute general disease, the texture of the organ is soft or impaired; when not connected with a general disease, but occurring from ordinary exposure as a form of acute inflammation, the liquor sanguinis exuding into the interstitial spaces of the tissue, is more firmly coagulable or plastic, the connective tissue itself undergoes more rapid hepatization and hypertrophy, and the density of the organ is increased. As a general rule in such cases, the density will be increased in proportion to the duration of the disease; consequently when it assumes the chronic form the connective tissue becomes greatly thickened, hypertrophied by the addition of plastic material, and the interspaces become filled with lymphoid cells of various sizes and shapes, not only giving rise to great engorgement of the organ as a whole, but giving to its texture much greater density and firmness.

In nearly all these cases, however, the exterior of the spleen retains its smoothness and evenness of surface.

Diagnosis.—As I have already intimated, the diagnosis of acute inflammation of the spleen is not difficult or obscure. The sudden development of acute pain, tenderness to pressure on percussion, more or less general febrile movement, and particularly in addition to this, the rapid enlargement of the organ, as indicated by an increased area of dullness on percussion, leaves no room for doubt as to the nature and seat of the disease. From pleurisy it is of course distinguished by the fact, that the pain, enlargement and fullness are all located below the attachment of the diaphragm, and the further fact, that there is neither friction sound coincident with the respiratory movements on that side of the chest, nor dullness extending above the diaphragm to indicate any effusion that might exist in the second stage of pleurisy. From gastritis it is distinguished by the decided difference in the character of the pain, and by the absence of the persistent vomiting, acute epigastric tenderness and distension which exist in the latter disease, and are not present in the splenitis. But there are some cases of chronic inflammation, and enlargement or induration of the spleen, in which, after the disease has continued for a considerable length of time, there may be some difficulty in arriving at a satisfactory and positive diagnosis from the enlargement that belongs to leucocythæmia, pernicious anæmia, sometimes to cirrhosis of the liver, or occasionally results from malignant growths in the tissue of the spleen. But if you remember that the splenic affection connected with the leucocythæmia is accompanied by other evidences of the same general disease in other glands, coincidently, as was described when I treated more particularly of that affection, and the same in regard to the coincident conditions in pernicious anæmia and cirrhosis, it will enable you to keep clear the line of distinction between simple chronic inflammation and induration, and splenic affections accompanying the other diseases just named. In regard to malignant growths causing enlargement of the spleen there are two almost constant points of difference, which should engage your attention ; the first is, that malignant growths in the spleen commence obscurely with little or no evidence of inflammatory action during all their early history, and are accompanied by a much more de-

cided general cachexia than belongs to ordinary chronic inflammation of that organ. The other is that nearly all malignant growths involving the spleen cause it to become irregular in its outline, nodulated upon its surface, some points being more prominent and dense than others, while the enlargement from simple inflammation is more general, and preserves a more even and uniform condition of the surface.

Prognosis.—Nearly all the cases either of acute or chronic inflammation of the spleen, if brought under judicious management during the early period of their progress, terminate favorably. Consequently, there is not a very high ratio of mortality resulting from this affection in any grade, acute or chronic, except when it has been neglected during the early stage, or when, as occasionally happens in warm climates, the inflammation has assumed that rapidly advancing and suppurative character that corresponds almost directly with what is denominated acute yellow atrophy of the liver. But when in the earlier stages of their progress, chronic cases have been neglected until the organ has acquired a large size, and greater density of structure, it is very liable to remain an indefinite period of time without undergoing resolution by any process of treatment that has yet been devised. Still, life may be prolonged many years. When it does terminate fatally, it is more generally from the effects of mechanical pressure interfering with the function of surrounding organs, than from direct influence of the disease of the spleen itself.

Treatment.—In regard to the treatment of all grades of inflammation of the spleen, I need do no more than remind you that the same principles and the same remedies are applicable here as in the treatment of corresponding grades of inflammation in the liver. I have not been enabled to detect any essential difference in the effects of remedies, or in the necessity for their use, between the corresponding grades of inflammation in the liver and in the spleen; consequently we will not repeat here what was said with a sufficient degree of detail in the preceding lecture.

Inflammation of the Pancreas.—That the pancreas is sometimes the seat of inflammatory action there can be no doubt. In many instances, in making post-mortem examinations where the patient has suffered during life from inflammation within the abdominal cavity, the pancreas has been found to present all the evidences of acute or subacute inflammation. That it is very rarely the primary seat of this form of disease is also undoubtedly true. Its deep-seated position makes it difficult to trace its outline unless it be greatly enlarged or indurated, and difficult to determine whether any given pain or tenderness is located in that organ, or in any of the textures or viscera surrounding it. That some of the cases with which we meet of very obscure and persistent derangements of the later stages of digestion, or of the changes that naturally take place in the duodenum, as well as the rare cases of diarrhœa, characterized by fatty dejections, are connected with an inflammatory condition of the pancreas, I have no doubt. Some writers have reported a few cases of sudden death in which the only post-mortem appearances were the presence of acute inflammation of the pancreas. In other cases of chronic disease terminating fatally, post-mortem examinations have revealed various degenerative conditions of the pancreas, in some instances, fatty degeneration of its texture, in others sclerosis, or hypertrophy of the connective tissue. Perhaps the most frequent disease that is seen of a non-inflammatory or malignant character consists of the scirrhus or colloid form of cancer, chiefly occupying the head of the pancreas, and generally connected with scirrhus of the pylorus, or of the adjacent tissues.

Two instances have come under my own observation, of scirrhus of the

pancreas, causing the head of it to become twice its natural size, to be easily felt through the walls of the abdomen, and recognized as belonging to the pancreas, rather than the pylorus or other tissue by the elongation of the tumor transversely in reference to the abdomen, and at the same time the absence of some of the symptoms of obstruction in the pyloric orifice, that usually accompany cancers in that part. There are no well established diagnostic symptoms by which you can recognize the various inflammatory conditions of the pancreas, and consequently it would be futile in the present state of our knowledge to undertake the consideration of them more in detail. I shall, therefore, next direct your attention to the inflammations of the kidneys, and other portions of the urinary apparatus.

Inflammations of the Genito-Urinary Organs.—Under the designation "genito-urinary organs" is included the kidneys, urinary passages, and the male and female organs of generation. But the universal custom of considering diseases affecting the female organs of generation in works upon midwifery and gynecology, and those of the male organs including the urinary passages and bladder, in works upon surgery, remove the consideration of these from the field of practical medicine; consequently there is left for us to consider only the inflammations affecting the kidneys.

Nephritis.—In considering the inflammatory conditions of these important organs it will be convenient to group them under the following heads: simple hyperæmia or renal congestion, acute and chronic diffuse nephritis, and acute suppurative nephritis. Hyperæmia, or congestion of the texture of the kidney, may occur from three separate pathological conditions; first, from directly increased determination of blood, causing the condition properly denominated active congestion; second, from paralysis, or diminution of the vasomotor influence over the arterioles of the kidneys, by which they are allowed to dilate and receive more blood than normal, and third, similar vasomotor paralysis or impairment of the venous radicles, by which the blood accumulates in the venous side of the circulation in those organs. The causes which may give rise to these various forms of hyperæmia of the vessels of the kidneys are various. The first or active grade of hyperæmia most frequently results from the action of irritating substances taken into the stomach, and carried to the kidneys for elimination; such as the slighter grades of irritation arising from cantharides, turpentine and other substances, that are capable of being eliminated freely from the blood through these organs, and are more or less irritating in their influence.

It is probable, also, that these forms of disease may originate from constant exposure to cold, sudden wetting, over-heating, or warmth. The causes capable of giving rise to paralysis of the vasomotor nerves belonging to the arterioles of the kidneys are well understood; but the hyperæmia of the smaller veins, constituting what some writers term true passive congestion of the external portion of the kidney, originates or may originate from all those pathological conditions which interfere materially with the oxygenation and decarbonization of the blood. It is therefore this form of renal congestion that occurs frequently in connection with such structural diseases of the heart as induce more or less constant overfullness of the vessels of the lungs, the advanced stages of phthisis, some cases of pneumonia, the typhoid grades of general acute diseases, and any of the general dropsies, which proceed far enough to produce dyspnœa, or cardiac obstruction, and thereby lessen the amount of oxygen taken up and of carbonic acid gas eliminated through the lungs. You will thus perceive that passive congestion of the kidney occurs

almost exclusively as a secondary affection resulting from serious prior diseases, and not as a primary affection. In a large proportion of all the cases of acute general disease that terminate fatally, especially those of an infectious character, post-mortem examination shows more or less passive congestion of the kidneys. When renal hyperæmia arises from prior acute diseases, it attracts no more attention than any other secondary functional derangement, usually disappearing with the subsidence of the cause with which it is associated. On the other hand, when a congested condition of the kidney remains, after the subsidence of the cause that may have induced it, there is danger that it will so far interfere with the elimination of the natural elements of urine as to allow the blood to retain an excess of these elements and lead to some one of the more serious consequences of uræmic poisoning, such as violent vomiting and purging, or the sudden occurrence of convulsions, followed by more or less paralysis, and sometimes by coma and death. It is necessary, therefore, that attention be given in all cases to the condition of the kidneys during the progress of such diseases as interfere with the respiratory function, either directly or indirectly, so far as to impair the function of the vasomotor nerves connected with the renal vessels. The symptoms which indicate renal hyperæmias during life vary with the varying pathological conditions that I have already mentioned. Perhaps in all cases of active determination of blood to the kidney, under the influence of irritating agents, the urinary secretion is decidedly diminished in quantity, usually redder than natural, containing less urea, and, for a time at least, some albumen. The hyperæmia dependent upon dilatation of the arterioles is more frequently accompanied by increased flow of urine above the natural standard. Indeed, some writers have considered the real cause of diabetes insipidus to be a paralyzed and passively congested condition of the arterioles. The urine, however, while increased in quantity, has a low specific gravity, seldom contains any abnormal elements, but simply a large excess of water in proportion to its solid constituents. The excessive flow of water diminishes the watery element of the blood, often giving rise to increased thirst, more or less shrinking of the tissues, or emaciation, generally decided loss of strength, or power of endurance, and much wakefulness, and other symptoms indicating nervous excitability. It is undoubtedly this form of hyperæmia of the kidney depending upon dilatation of the arterioles that gives rise to the copious secretion of limpid urine, so characteristic of many cases of hysteria. On the other hand, in those cases of renal hyperæmia dependent upon impairment of the vasomotor influence over the renal veins, there is almost uniformly a diminution in the quantity of urine secreted. Frequently it is of a dark, brownish color, sometimes containing epithelial cells, often red corpuscles of blood, and not infrequently traces of albumen. The quantity of ureas is also in these cases very generally diminished. If the congestion is connected with the existence of some permanent structural disease of the heart or lungs, and consequently not capable of any permanent removal, the secretion of smaller quantities of urine, and the consequent favoring of the accumulation of the watery element of the blood in the vessels, increases the tendency to general dropsical infiltration of the areolar tissue in all parts of the body. Consequently, if no dropsical effusions have existed prior to the occurrence of this form of renal congestion, it is soon followed by the development of some indications of general œdema. This is seen first in the morning, when the patient rises from the bed, more noticeably in the face and loose tissues of the eyelids, and more prominently,

if the patient sits up during the day with the feet in a dependent condition, in the tips of the feet and ankles. And ultimately the renal congestion continues, general dropsy and infiltration of the areolar tissues throughout the whole system almost necessarily follows. As this general anasarca increases throughout the system the urinary secretion becomes less and less in amount, till oftentimes the elimination of urea is so small that the symptoms of uræmic poisoning supervene, and frequently hasten the fatal termination of the case. The anatomical changes which result from this hyperæmic condition of the kidney vary much, both from the varying degrees of intensity of the congestion and its duration. Perhaps in all cases of active congestion the kidney is somewhat increased in size, and presents more or less of a mottled color; portions of it being paler than natural, while other parts are deep red, or of intermediate shades of color. Those cases dependent on venous congestion almost always present a moderate degree of enlargement of the kidney, with a dark red appearance of the pyramidal bodies, some degree of exudation in the malpighian tufts, and around the glomeruli, and sometimes a slight extravasation of blood.

Diagnosis.—The diagnosis of the different grades of hyperæmia, or renal congestion, depends mainly upon the coincident condition of the patient in relation to other diseases, and the direct quantity or quality of the urine. It is rare that in any of these cases there is sufficient pain, either in the region of the kidneys or on evacuating the water, to attract attention, or to indicate the pathological condition. Sometimes, however, when active congestion arises from sudden exposure to cold, or from the existence of direct irritating substances circulating in the blood, there will be a moderate degree of dull, aching pain directly in the region of the kidneys, sometimes shooting downward in the direction of the ureters. Unless the hyperæmia continues until it develops active inflammation, the pain is only moderate and of temporary duration, while the condition of the urine will aid in establishing a diagnosis. In the first class of cases it is small in quantity, with a diminished proportion of urea, and very generally contains some traces of albumen, with occasional fibrinous casts, but usually less than in actual nephritic inflammation. The characteristic condition of the second form of congestion, dilatation of the arterioles, is increased flow of urine with less than the normal proportion of urea, and other natural excretory elements of urine, and an entire absence of morbid elements of any kind. The third is characterized by diminution of the amount of urinary secretion, its darker color, more generally slight traces of albumen, fat granules, and frequently traces of red corpuscles of the blood. These conditions are generally associated with more or less general dropsy, or with the last stages of wasting suppurative diseases. Of the treatment of these hyperæmias it is unnecessary to speak till we consider the different grades of inflammation of the kidney.

Acute Diffuse Nephritis, or Acute Bright's Disease.—Acute inflammation, invading the structure of the kidney generally, constituting what we have designated as *acute diffuse* nephritis, seldom occurs as a primary or idiopathic affection, but in far the larger number of cases, it occurs either during the progress, or as the sequel, of some one of the acute general diseases of an infectious character. Perhaps three fourths of all the cases met with in general practice originate in connection with, or during convalescence from, scarlet fever. Less frequently it follows the other eruptive fevers, such as measles, small-pox and erysipelas. Occasionally cases occur during the convalescing period from both typhoid and typhus fevers, but very rarely from the other general febrile affections. When the dis-

ease originates idiopathically, or independent of the prior existence of other diseases, it is generally caused by the direct impression of cold and damp. Sleeping in cold or damp rooms or beds, going into the water when the body is at a high temperature from previous exercise, or becoming thoroughly wet, and then suddenly chilled, are conditions most likely to cause an attack. This form of disease is also capable of being induced by the action of direct irritants. The introduction into the system of cantharides, either by the mouth or absorbed from blistered surfaces, oil of turpentine, oil of mustard, cubebs, carbolic acid, and a variety of other substances, have occasionally been found capable of producing direct irritation and inflammation of the renal structure.

Symptoms.—Whatever may be the direct cause, whether it be the conditions growing out of previous diseases, the direct irritants introduced into the system, or the impression of cold and damp upon the surface, the symptoms which indicate the commencement of an acute attack of nephritis, are usually well marked. They consist of pain pretty severe in the back and loins, increased by motion or turning the body, acceleration of pulse with increased fullness, decided increase of temperature of the body, more frequent respirations, considerable thirst, much restlessness, an expression of anxiety in the countenance, and a very decided diminution in the quantity of urine secreted. Sometimes the desire to urinate is accompanied by a sense of heat, at other times by no apparent local irritation in the urinary passages, and the urine passes only at regular intervals and in very small quantities—what is passed is usually either of a turbid appearance, or redder than natural, and pretty uniformly yields a copious precipitate of albumen upon the application of heat or nitric acid. If the urine be further analyzed, it will be found to contain decidedly less than the natural proportion of urea and excretory elements of urine, while the microscope will usually detect more or less red corpuscles of the blood, fibrinous casts, shreds of solidified fibrin, and usually some epithelium, evidently from the urinary tubles. The assemblage of symptoms which I have described, leave no reasonable doubt as to the existence of some degree of diffuse nephritic inflammation. If it is not speedily relieved, additional symptoms of striking importance follow. In the more acute class of cases, within twenty-four hours from the commencement of the attack, the retained urea will be found to manifest its irritant effects, either upon the mucous membrane of the digestive organs, or perhaps more frequently upon the nervous centers. If upon the first, there is vomiting, active and severe, followed not infrequently by copious watery diarrhœa, rapidly exhausting the patient, and giving the case much the appearance of genuine cholera morbus; while in the second class of cases, in which the irritant effects are developed in the nervous centers, there is first jerking of the muscles, sudden motions of the limbs, some degree of delirium, and if no modification of the progress of the disease is made by treatment, during the latter part of the second or the third day, in a large proportion of the cases, general convulsions will occur. Sometimes the first severe general convulsion is followed by coma, dilated pupils, stertorous breathing, entire suppression of the urinary secretion and death in a few hours. At other times the convulsion after a few minutes ceases, leaving the patient drowsy, breathing heavily, and after from ten to thirty minutes, consciousness is regained, and for a time varying from a few minutes to two or three hours, the patient will appear much as before the convulsion occurred, when suddenly another paroxysm will occur, of the same character as the first, fol-

lowed by the same results, only leaving the patient more dull and depressed, the pulse quicker, smaller than usual, the extremities cooler, with a constant puffiness of the face, some general tumefaction, especially of the hands and feet, producing the appearance of a moderate degree of œdematous infiltration into the areolar tissue. The urinary secretion is now usually exceedingly small and so highly albuminous as to form a coagulum, almost like the white of an egg. Very frequently also more decided quantities of blood appear in the urine. The patient may now pass into another convulsion, ending in entire coma, collapse and death, or without further convulsions, the breathing may become more labored, irregular and sighing, the mind more dull, making it difficult to arouse the individual, pupils steadily dilated, very frequently the axes of vision are not parallel, the eyes being turned in different directions, and one pupil possibly more dilated than the other. Often one arm and one leg are found entirely paralyzed, while there are frequent automatic movements of the other, such as drawing up the leg, putting it down, and tossing the hand in different directions. And by the fourth or fifth days entire coma supervenes, accompanied by involuntary discharges from the bowels, entire suppression of the urine and an early death. The progress of these cases varies much in different patients. I have seen some cases terminate fatally within thirty-six hours from the first appearance of the renal trouble, by violent convulsions and coma. Others have been so slow as to reach a fatal result only at the end of from seven to nine days. More frequently, when they terminate fatally in the acute stage, death supervenes between the end of the second and the commencement of the fifth day. The symptoms of acute nephritis, as I have just described them, are more particularly applicable to that class of acute cases which follow scarlatina, and the convalescing stage of other eruptive diseases. Almost identically the same assemblage of symptoms and succession of changes and results take place in those cases of acute nephritis that occur in the latter stages of pregnancy, and sometimes culminate at the time of delivery, giving rise to what is denominated puerperal convulsions or eclampsia.

I recollect two cases of acute nephritis caused directly by the influence of cold and wet: One was a laboring man, working upon the open prairie in the latter part of summer, and camping out during the night with imperfect protection, who suffered a thorough wetting from a copious shower of rain during the night, followed by a sudden change in the temperature of the atmosphere. In this case, within twenty-four hours after the wetting, the patient was taken with severe dull pain in the loins and directly opposite the two lower ribs and their junction with the spine. Pain was increased by moving the body; febrile reaction took place sufficient to cause the temperature to rise to 30° C. (102° F.); the skin was dry and hot, face suffused with redness, puffiness under the eyes, a heavy dull pain in the frontal region of the head, a white coat upon the tongue, pulse 110 per minute and moderately full, bowels quiet, and the urinary secretion exceedingly small, not more than from two to four ounces being voided three times during the twenty-four hours preceding my visit. On examination, the urine contained a large proportion of albumen, some fibrinous shreds, and a considerable number of red corpuscles of the blood. By active treatment, this case was relieved in three or four days, and ultimately so far recovered as to leave no permanent injurious consequences. Another case, originated from getting the feet wet and cold near the period of menstruation. It happened to the mother of a family, aged about thirty-five years, in whom the attack was

characterized by pain in the back, extending more or less to the limbs. Almost immediately drowsiness occurred, and such a disposition to sleep that she was incapable of being aroused sufficiently to fix her attention on anything. There was increased heat of skin, a quick, rather sharp pulse, but the respirations were slow, variable, sometimes sighing. There were slight jerkings of the muscles, but no general convulsions. From the early appearance of dullness, approaching stupor, the patient made but little complaint, and consequently her danger was not discovered till the disease had progressed thirty-six hours from the time of its commencement. At that time I found her in the state I have just described. She had passed no more than two ounces of urine in the previous twelve hours. This, on examination, contained so large a proportion of albumen, that when to a small quantity in a test tube was added a few drops of nitric acid, the coagulum occupied the whole space. This patient proceeded directly and rapidly to complete coma; dilatation of the pupils occurred, paralysis of the sphincters, involuntary discharges from the bowels, and death on the third day. This case will serve to illustrate some of the features of the disease, and especially to impress upon your minds the extreme danger which accompanies acute attacks of nephritic inflammation. You will perceive that the chief characteristic symptoms are the marked diminution in the quantity of urine, the appearance of albumen in it, coincident with diminution in the proportion of urea and excretory elements; the almost immediate appearance of more or less puffiness from œdematous infiltration into the subcutaneous areolar tissue, more especially of the face and eyelids, tops of the feet about the malleoli of the ankles and backs of the hands. Subsequently there is a filling up of the areolar tissue almost universally throughout the system from serous infiltration. To these must be added an almost constant tendency to develop symptoms of uræmic poisoning, either in the digestive organs or nervous centers.

Anatomical Changes.—The anatomical changes presented on making post-mortem examinations of patients having died from acute diffuse nephritis, differ much. The most constant of these changes are alterations in the color and size of the kidney; the organ being pretty uniformly moderately increased in size, and more vascular, that is, containing a larger amount of blood than natural. Yet there is seldom that intense red color which characterizes most of the textures of the body in a state of acute inflammation. But there are limited portions of the cortical texture of the kidney and of the pyramidal bodies that are of a deep red color, while others are perhaps paler even than natural. Close examination will also show, in nearly all the cases, more or less hemorrhagic exudation, or mild extravasations of blood, especially about the malpighian tufts, and around the glomeruli. The microscope will show more or less of the migrating or white corpuscles in the interstitial spaces of the tissues, disturbance of the epithelium in the urinary tubules, the presence in them, also, of more or less of the fibrinous casts, hyaline bodies, altered epithelial cells, very generally some fat granules, and hypertrophy of the connective tissue. The most characteristic anatomical changes are, the mild hemorrhagic exudations, fibrinous casts in the tubules, accumulations of exuded liquor sanguinis in the malpighian bodies and around the glomeruli, the latter of which are not infrequently blocked up, while the alterations in color and size are much more variable. The texture of the kidneys, as altered in acute nephritis, is softer than natural, and the capsule easily detached.

Diagnosis.—The principal diagnostic symptoms I have already speci-

fied, when speaking of the clinical history of the disease, and need not repeat them at this time.

Prognosis.—Although acute diffuse nephritis is a severe and dangerous malady, liable to occur at any period of life, and if left to itself extremely liable to terminate unfavorably, yet under prompt and judicious treatment the larger proportion of cases recover. But such are the consequences of interfering with the depurative action of the kidneys, that often under the best of management a considerable ratio of mortality will attend the more severe attacks of this disease. As a general rule, so long as the amount of urine secreted, and the proportion of urea contained in it, is sufficient to prevent the development of symptoms of uræmic poisoning, the prognosis may be considered favorable. If the case proceeds so far as to develop the consequences of retention of urea and the excretory elements of the urine, so far as to induce either the preliminary nervous startings, or any degree of general convulsive movements, the danger must be admitted to be grave. Yet a considerable number of cases, after proceeding to this extent, will be found to yield promptly to judicious treatment. There is some tendency in the acute form of diffuse nephritis to partially subside, and end in the chronic form of the disease. When it does so, although life may be prolonged many months and sometimes two or three years, the patient seldom makes an entire recovery but ultimately succumbs, under the effects of general dropsical infiltrations, first, into the areolar tissues and subsequently into the serous sacs or cavities of the body.

Treatment.—In the treatment of those cases which are described under the head of hyperæmia or congestion of the kidneys, it is necessary to exercise proper discrimination in regard to the special pathological conditions which may give rise to the accumulation of blood in those organs. It will readily occur to you that a case of hyperæmia, caused by active determination of blood to the kidneys, would require very different treatment perhaps from a passive hyperæmia originating from diminution of vasomotor influence over either the veins or arterioles. When cases are met with of the first variety—that is, depending upon active determination of blood, and yet not having advanced to the stage of true inflammation, it is usually sufficient to commence the treatment by the application of dry cups to the loins, and the administration of some combination that will lessen the force and frequency of the arterial circulation, and at the same time promote moderate evacuations from the bowels. A solution of the bitartrate of potassium, in the proportion of ten grams to one hundred and eighty cubic centimeters of water, may be made, of which the patient can take eight cubic centimeters, or an ordinary dessert-spoonful every four hours, until it shall promote moderately free evacuations from the bowels. If there is considerable general febrile movement, with some degree of acceleration and fullness of the pulse, it will increase the efficacy of the remedy if four minims of the tincture of veratrum viride is added to each dose of the solution of the bitartrate. Usually, this medication results within the first twenty-four hours in procuring an increased flow of urine, two or three free evacuations from the bowels, and, in most cases, of simple, active, renal hyperæmia, will afford all the relief that is necessary. Cases which may have resulted from the taking of some irritating substance as cantharides, turpentine, etc., may be treated in the same manner as just mentioned, accompanied by the free use of diluent drinks, such as mucilage of slippery elm (ulmus fulva), gum arabic, or flax seed. In those cases of renal hyperæmia dependent on impairment of vasomotor influence, which constitute the most common

class of cases, arising, as previously described, from imperfect oxygenation and decarbonization of the blood, much of the treatment must consist in the administration of such remedies as are calculated to mitigate the severity of the primary disease, of which the renal trouble is only a complication. In addition I have found, in almost all the cases in which digitalis could be well borne, that it constituted a valuable remedy, both by its influence in increasing the force and steadiness of the heart's action and in encouraging increased secretory activity in the structure of the kidney. In some instances, I have derived much advantage by combining digitalin and ergotin in moderate doses, and giving them at intervals varying from once in four to once in six hours.

In the cases dependent on alteration in the vasomotor influence over the arterioles of the kidney, accompanied by increased flow of urine, occurring most frequently in nervous and hysterical conditions, the most appropriate remedies are such as exert a direct tranquilizing influence over the nervous excitability. The bromides, the hydrate of chloral, the different preparations of valerian, and sometimes, though rarely, moderate doses of the compound powder of opium and ipecacuanha with camphor, given at night, will constitute the remedies that usually succeed, unless the case has gone so far as to constitute actual diabetes insipidus, or a habitually increased flow of urine. If it has assumed that form, the use of these remedies, in connection with the use of full doses of ergotin, will usually be found most efficient. When the renal affection passes beyond the stage of hyperæmia, and constitutes an attack of inflammation of an acute character, the appropriate remedial agents must be well chosen, and applied with promptness, in order to secure the best results in behalf of the patient. In young, vigorous subjects, especially of a sanguine temperament, if the attack has come on suddenly by exposures to cold and wet, and the general febrile reaction is active and well marked, there is no doubt but that one free venesection is beneficial, and can hardly be omitted, with full justice to the patient. If, however, venesection is not deemed advisable, the application of leeches, if they can be commanded, in numbers suited to the age of the patient and the gravity of the disease, will be the next most efficient remedy at the commencement of the attack. The leeches may be applied directly over the region of the kidneys, and after they have filled and fallen off, the bleeding from the bites may be promoted by the application of warm, wet cloths. In several instances, where leeches were not readily at command, the application of dry cups, producing a strong revulsive effect over the lower part of the dorsal and upper lumbar regions, has been productive of some degree of relief. At the same time that these measures are being carried out, it is well to open the bowels freely, and give, in addition, such remedies as are calculated to lessen general febrile excitement, and promote, as much as possible, eliminations from the skin, thereby preventing the accumulation of urea and other effete constituents in the blood, while the action of the kidneys is restrained by the inflammation. Although many writers and teachers have objected to the use of mercurials in renal affections, my own experience has been decidedly in favor of giving, as early as possible, a powder containing three decigrams (gr. v) each of calomel and nitrate of potassium, and repeating it every three hours, till four doses are taken, unless it sooner produces a free movement of the bowels. If, when it comes time to take the fourth or fifth dose, no evacuations have taken place from the bowels, I substitute, in the place of the powders, either the liquid citrate of magnesia, Rochelle salts, or the sulphate of magnesia, and continue their use until free evacuations have been obtained. In the mean-

time, if, as often happens when the disease comes on suddenly and actively, following some one of the eruptive fevers, and the urinary secretion is extremely small, pulse rapid, breathing hurried, skin hot, I have given between each of the doses of calomel and nitrate of potassium a sedative and diaphoretic mixture, consisting of the liquor ammonia acetatis sixty cubic centimeters (fl. ℥ii), spirits of nitrous ether thirty cubic centimeters (fl. ℥i), and tincture of veratrum viride four cubic centimeters (fl. ʒi), of which four cubic centimeters (fl. ʒi) may be given well diluted with sugar and water between each of the doses of the powder previously mentioned. I have sometimes, instead of giving this mixture, derived greater advantage by giving bitartrate of potassium and digitalis in combination, either in the form of infusion of the digitalis leaves in which the bitartrate is dissolved, which I think is the best method, or a solution of the bitartrate in water with the fluid extract of digitalis added in proper proportion for efficient action. The objects, as you will perceive, are to get, as early as possible in the progress of the disease, a free opening of the bowels, relying chiefly for that purpose upon the calomel and nitrate of potassium, aided, if need be, by a saline cathartic, to lessen the force and frequency of the circulation, and promote elimination from the skin, by either the digitalis and bitartrate, or the veratrum viride or aconite in connection with the liquor ammonia acetatis. By the bleeding, general or local, the free action of the bowels and skin, coupled with some sedative influence upon the arterial circulation, it is often the case that the fullness of the vessels of the kidney become relieved, and in from twenty-four to thirty-six hours all the symptoms of the patient are much ameliorated. The urine becomes more copious, with much less albumen in it; the fever abates, and it is only necessary to keep a moderate influence of the diaphoretics and sedatives through two or three subsequent days to complete the relief. The use of such tonics as tincture of the chloride of iron will then hasten the recovery of the patients from the state of anæmia and debility in which they are apt to be left.

And if, after the remedies just mentioned have been pushed for the first twenty-four hours, free evacuations have been obtained from the bowels, yet the amount of secretion from the kidneys remains very scanty, or somewhat tinged with blood, and the initial symptoms of uræmic poisoning begin to show themselves, such as twitching of the muscles, more or less dullness, stupor, wandering of the mind, with increasing œdema of the face, it may be well to administer pilocarpine, or the infusion of the leaves of the jaborandi, in sufficient doses to produce its specific effects upon the skin and salivary glands, with the hope of preventing further accumulation of the elements of the urine by eliminating them through the skin and mucous membranes, thereby giving further time for obtaining relief of the inflammatory action in the kidneys. I recollect no case coming under my own observation, in which, if the active treatment that I have indicated has been instituted promptly during the first twelve hours after the commencement of acute renal disease, relief has not been obtained, and before the patient has suffered from any paroxysms of convulsions, or serious derangement of the cerebral functions. But I have met with many cases, where, during the first twenty-four hours active measures were not instituted, in which the patients, when coming under observation were already exhibiting all the symptoms of commencing uræmic poisoning, either by drowsiness, jactitations, twitching of the tendons, extensive œdematous infiltration into the areolar tissue over the greater portion of the surface of the body, extreme diminution of the renal secretion, and sometimes active convul-

sions. When called thus late, the pulse is usually beginning to assume a small and rapid character, there is some alteration in the pupils, and altogether a condition which seems to contra-indicate the abstraction of blood. Yet occasionally at that late period, free dry cupping over the lower part of the back and loins has still been of advantage. But the great object in such cases has been to procure speedy and thorough evacuations through the skin and alimentary canal. To procure these, if the pulse is not too weak, I give sufficient pylocarpine to cause an early and full perspiration, and follow it directly with one moderately full dose of calomel and nitrate of potassium. If it does not operate in from two and a half to three hours, I administer a saline cathartic, and in the meantime have an infusion of the digitalis leaves with bitartrate of potassium prepared, so that as soon as the patient is fairly over the action of the pylocarpine, and the movement of the bowels, it can be given in such doses as will be tolerated. If you put eight grams of the bitartrate and an equal amount of the digitalis leaves into 260, c. c. of boiling water, stirring them occasionally till the infusion becomes cool, a tablespoonful of this may be given at first every two hours to adults and smaller doses proportioned to the age in children, watching its effects closely. If the specific effects of digitalis are manifested in rendering the pulse slow, the dose must be immediately diminished to one half and the length of the intervals between the time of administration doubled, thereby avoiding the exaggerated effect of the digitalis upon the pulse and respiration. I could enumerate a considerable number of cases of acute nephritis following scarlet fever, in which the renal affection had been permitted to continue unchecked, till severe and repeated convulsions had occurred, and the patient was apparently in an extremely critical condition, when the treatment I have just indicated brought about entire relief and recovery. I think, gentlemen, you may regard it as a positive rule in practice, that when cerebral disturbance, especially in the form of convulsive movements, or approaching stupor, coma, and paralysis, is the result of the retention in the blood of effete constituents of urine, or of any other toxæmic agent, little or no advantage will be gained by the administration of remedies, simply calculated to diminish nerve excitability, or to act as nervous sedatives and anodynes, simply because they in no degree either neutralize the toxæmic agents in the blood, nor promote their expulsion.

It is better, therefore, in all these cases, to direct your attention almost exclusively to the removal of the accumulated retained products on the one hand, through such channels as nature affords; while on the other hand, you leave no efficient means unemployed to relieve the direct fullness and congestion of the vessels in the kidneys. You will occasionally meet with cases perhaps in which, after several convulsions, the pulse presents that small, irregular quality, the extremities that coolness, and the face that pale, bloated aspect which would cause you to hesitate about the adoption of active evacuant remedies through fear of exhaustion. Experience shows that there is far less danger from exhaustion produced by efficient evacuations, provided they carry with them the toxæmic agents from the blood, than from the continued action of these agents, which are already paralyzing the cerebral centers, and endangering the life of the patient. As proof of this I might relate a number of cases: One of comparatively recent occurrence was that of a girl thirteen years of age, who had passed through a mild grade of scarlet fever. In about four days after the subsidence of the general febrile disease, while the skin was still rough from desquamation, she began to show symptoms of

subacute renal inflammation, which increased steadily for two or three subsequent days; at which time the urine had become very scanty, and highly colored with blood. The usual tests showed a large proportion of albumen in the urine, and there was general serous infiltration or œdema of the areolar tissues. In the early part of the evening she was seized with general convulsions. A physician from the neighborhood was immediately summoned, and was with her all the night, and until after breakfast the following morning. He administered very diligently the bromides and chloral alternately, and in combination with moderate doses of digitalis, but without apparently in any degree modifying the convulsions, which continued to recur. And in the morning, when I saw the patient, involuntary discharges had taken place from the bowels, a very moderate quantity of urine had been passed for the preceding twelve hours, the patient was profoundly stupid, the axes of vision not parallel, the extremities cool, with a very weak, quick pulse. Learning the history of the case, and the efforts to control the convulsions by nervous sedatives and quieting agents, and the entire inadequacy of the eliminations through any channel, I immediately advised that she be put upon powders of calomel and nitrate of potash, and have them repeated every two hours, with a dose of the infusion of digitalis and bitartrate of potassium between, taking the two prescriptions alternately, only an hour apart. Soon after the third dose of calomel and nitrate of potassium the bowels moved very copiously, but such was the unconsciousness of the patient at the time that the evacuations took place entirely involuntarily in the bed. No more convulsive movements followed, and in less than an hour some urine was voided, but as it was passed in bed, the quantity could not be ascertained. The patient began to breathe more naturally, and after another free movement of the bowels the powders were omitted and the digitalis and bitartrate were continued alternately with moderate doses of carbonate of ammonium and camphor. During the next four hours two more copious evacuations occurred from the bowels, and one quite free discharge of urine. Before it had passed, the symptoms had so far improved that the patient's attention could be aroused momentarily, she could take plain nourishment without much difficulty in swallowing, and from that time on there was a steady improvement until ultimate, complete recovery took place. I am the more particular to dwell upon the necessity of using direct and active measures for relieving the vascular fullness of the kidneys at the outset, and the subsequent establishment of those eliminations through the skin and mucous membranes as will most efficiently carry off the effete materials that are retained on account of the arrest of the function of the kidneys; because I have so frequently seen patients whose lives were lost during the persistent efforts of the physician to overcome the nervous symptoms and convulsions by ordinary antispasmodics, nerve sedatives and anæsthetics without any adequate effort to remove the offending cause existing in the blood and circulating through the nervous centers. After the patient is relieved from the more mixed symptoms and the function of the kidneys is in a great degree restored, very much care is required for several weeks to regulate the patient's diet, causing him to avoid all active exertion, either mental or physical, to avoid the use of all stimulating drinks, especially of the alcoholic class, and to use such tonics as tend to sustain the action of the kidneys and ultimately to restore the tone of the renal vessels to their natural condition. Of the tonics, probably none are better than the tincture of the chloride of iron during the convalescing stage of these cases. No diet is better than that consisting chiefly of milk and farinaceous articles. If, as sometimes hap-

pens, the pulse continues to have a quick jerking quality, with softness and ready compressibility, showing irritability with diminution of strength, or tone in the vessels, moderate doses of digitalis may be continued for a considerable time. In some cases I have used ergot, or ergotine, in connection with the digitalis, with benefit.

One measure that is very generally recommended in the first stage of these cases, especially in children, I have omitted to mention. I allude to the use of the warm bath. In children and young subjects much importance is attached by many to immersing the patient almost wholly, directly at the commencement of the disease, in the warm bath for the purpose of producing early relaxation of the skin, as well as exerting some revulsive influence from the kidneys. After the patient is taken out of the bath, the trunk of the body is wrapped, especially the loins and abdomen, with napkins or a folded sheet wet in warm water, to which may be added the fluid extract or tincture of digitalis so as to bring this agent in contact with the skin. By the warm bath followed by the warm wet bandage around the trunk of the body, the latter containing more or less digitalis, it is supposed that much benefit may be obtained: first, by the action of the warmth upon the surface in promoting cutaneous relaxation and elimination; and secondly, by some degree of absorption of the digitalis through the cutaneous surface. Theoretically, this measure should produce decided benefits, and I would encourage its use, especially in the early stage of the disease.

LECTURE LVIII.

Chronic Nephritis—Its Causes, Symptoms, Anatomical Changes, Diagnosis, Prognosis, and Treatment.

GENTLEMEN: Cases of chronic nephritis are met with in practice much more frequently than those of an acute form. In some instances they are the sequelæ or result of a prior acute attack. Much more frequently, however, the chronic grade is primary, so far as the renal affection is concerned, and in its causation is very generally the sequel or completion of prior morbid conditions. Etiologically, the cases of chronic nephritis met with in practice may be arranged in four groups; the first, which embraces much the smaller number, is the result of imperfectly relieved acute attacks; the second depends directly upon the action of some toxæmic or irritant material, either retained in the blood, or received in connection with food, drink or medicine; the third originates during the progress, or in the convalescent stage of acute general diseases, more particularly of the eruptive fevers, and the fourth occurs as a complication in the progress of chronic structural diseases, such as cardiac affections, pulmonary obstructions and long continued ulcerative conditions of the mucous membrane of the alimentary canal. The particular causes alluded to, as producing the second class of cases, are chiefly such agents as cantharides, oil of turpentine, oil of mustard, arsenical preparations, carbolic acid, and more frequently than all of these, the habitual use of alcoholic drinks. The latter agent probably produces at least two thirds of all the chronic cases of nephritis that are met with in general

practice. They are usually alluded to under the name of albuminaria or Bright's disease. Concerning the causes constituting the third class, I have already commented sufficiently in speaking of the causes of acute nephritis. It is probable that this class of cases originate in irritation set up in the renal tubules, coincidently with the specific inflammations that occur in the cutaneous surface, or in the fauces and glands of the neck, and after the subsidence of the general disease, there remains a similar disturbed and irritable condition of the renal tubules and secreting structure of the kidneys as exists in the cutaneous tissue during the process of desquamation. It is this impairment of the natural relations of the secreting cells, urinary vessels and uriniferous tubules, that gives rise to the congested condition and consequent moderate diminution in the elimination of urinary materials. This, if overlooked, gradually increases from day to day, till in one, two, or sometimes three weeks from the time the patient is supposed to be convalescent, he begins to show some degree of dropsical infiltration both in the face and extremities. And this is often the first thing to attract the attention either of the patient or his friends. The mode by which renal disease is established in connection with organic or structural disease of the heart, lungs and other chronic diseases differs in different cases. In affections of the heart, where the kidneys become most frequently involved, it would seem that the renal disease begins substantially with the occurrence of venous congestion. Obstructing the circulation through the heart causes direct congestion of pulmonary capillaries, leading in its turn to defective oxygenation and decarbonization of the blood. This causes the blood circulating in the structure of the kidney to be deficient in the oxygen necessary for maintaining the normal properties of the secreting cells, and, consequently, less urine is eliminated. The same condition of the blood causes dilatation of the renal vessels, and soon establishes habitual passive congestion with some escape of albumen in the urine. The occurrence of this scanty secretion of albuminous urine is generally accompanied also by more or less epithelial cells, fat granules, hyaline casts, and, of course, causes a rapid relative increase in the watery elements of the blood, and the hastening on of general dropsical symptoms. It is probable that the renal affection and dropsy so often accompanying the advanced stage of all the slow, wasting forms of disease, have the same origin, namely: the inefficient action of the blood in its impaired and impoverished condition upon the secreting cells and vessels of the kidneys, failure of the eliminations is the result, and by such failure more water is retained in the blood, and this in its turn hastens the general dropsical effusion throughout the system. The *modus operandi* of alcohol in producing chronic renal disease is, in part at least, of a similar character. The daily impregnation of the blood with a limited quantity of alcohol diminishes the amount of oxygen taken up through the air cells of the lungs, and the carbonic acid gas eliminated. Consequently the blood is deficient in its oxygenation and decarbonization, and is, therefore, incapable of promoting a natural degree of activity in any of the important secreting structures of the body. Indeed it retards the natural molecular movements throughout the system and retains the organic atoms of the tissues beyond their natural duration and until they undergo more or less fatty degeneration. It is thus that the texture of the kidneys becomes impaired. Sometimes a decided inflammatory action is set up and hypertrophy or sclerosis of the connective tissue occurs with desquamation, or casting off of the epithelium. This leads ultimately to a contracted granular condition of the kidney, which constitutes the typical form of Bright's disease, as originally

described by Dr. Bright himself. In other instances the degenerative changes take more the direction of fatty, amylaceous or waxy degeneration, in which the kidneys, instead of being contracted and firm, become large, pale and flabby. With these allusions to the various causes which give rise to chronic nephritis, the different pathological conditions which are present, you will be ready to infer what is a very important clinical fact; that under the head of chronic nephritis there are included in the books, and by different writers, a considerable variety of morbid conditions arising from the action of various causes, differing decidedly one from another, and while the general result in the end is, in all of them, or nearly all, general dropsy, progressive impoverishment of red corpuscles and ultimate death of the patient, yet they reach this final result by somewhat different processes, and in very variable periods of time.

Symptoms.—The symptoms of chronic, diffuse, interstitial nephritis vary much, as might be expected from the varying character of the causes which are capable of inducing it. In the great majority of instances the early symptoms are obscure, and are often either overlooked or misinterpreted till in some cases several weeks or months have elapsed, or there are indications of uræmic poisoning and dropsical effusions which first attract the attention of the practitioner to the real source of the difficulty. In most cases, in the early stage of this form of disease, the patient complains of little else than simply progressively increasing weakness, of getting tired easily, of a proneness to mental depression, a variableness of appetite, and also a variable condition of the digestive functions. Sometimes food is taken and digested well, but more frequently digestion is accompanied by more or less flatulency, and a moderate degree of constipation—the latter sometimes alternated with temporary turns of diarrhœa. The patient soon presents unusual paleness of countenance, indicating diminution of the proper proportion of red corpuscles in the blood, with a puffy or slightly swollen appearance of the face, especially on rising from the bed in the morning. In most instances in this early stage there are some pains, or, more properly, a tired feeling in the back and loins, and a more frequent desire to urinate than natural; the urine being for the most part pale in color, sometimes abundant, more frequently scanty. Many of this class of patients also complain of frequent turns of headache. When the paroxysms of headache are severe, they are usually accompanied by nausea and vomiting. With the headache a sense of heaviness and dizziness are common symptoms, and sometimes temporary dimness of vision or dark spots before the eyes. After these symptoms, or some of them, have continued for a variable period of time, often from two to three or four months the indications of dropsical effusion become more marked, usually first in the face, underneath the eyes in the morning, from which it disappears partially during the day, but in proportion as it recedes from the face the puffiness and swelling of an œdematous character increases in the tops of the feet about the malleoli of the ankles and parts most dependent. Dropsical symptoms having thus begun continue slowly but steadily to increase, till there is a more or less pale, anæmic and bloated hue of the countenance, while the œdematous infiltration of the feet, ankles and legs gradually increases till it occupies the whole of the lower extremities, up to the scratum and lower part of the abdomen. At that stage of the disease, when the dropsical symptoms become more marked, the urine usually becomes more scanty in quantity, sometimes being tinged with blood, but more frequently presenting simply a slightly turbid and pale appearance. The bowels at this stage of the disease are almost always variable, being most of the time inclined to constipation, but this is alternated every few days with temporary turns of looseness or

slight diarrhœa. The digestion of food becomes still more imperfect than in the early stage, the appetite also much more variable or lost. The disturbances of the nervous system, such as headache, giddiness, temporary appearance of spots before the eyes, all become more marked and frequent than in the early stage. All this assemblage of symptoms continue steadily to progress, if not modified by treatment, until dropsical infiltrations come to fill the areolar tissue beneath the skin over almost the entire surface of the body; being most prominent in the most dependent parts, which are usually the lower part of the trunk of the body and lower extremities. Later the legs become so full as to give the skin a very tense and shining appearance, and in the advanced stages frequently cause bullæ or blisters to make their appearance, followed by superficial ulcerations and the dripping of serum, sufficient to keep the clothes of the patient and the bed upon which he lies constantly wet. The more fully the tissues of the body are infiltrated with the serum the more scanty as a rule the urine becomes till in the advanced stages the amount passed each day is very small, when the symptoms usually take one of three directions. In at least one third of the cases after the patient arrives at this stage the elimination of urea and excretory elements of urine become so small that the accumulation of these materials in the blood begin to display their toxic effect upon the nervous centers and cause, first, muscular twitchings, more decided headache, dimness of vision, sometimes dullness of hearing, and finally general convulsions, dilatation of the pupils of the eyes, coma and death. Perhaps one third of all the cases of chronic interstitial nephritis, or chronic Bright's disease, as it is more frequently called, terminate fatally through uræmic poisoning. Death does not occur always by action upon the brain, however, for in some instances instead of producing the nervous symptoms followed by convulsions and coma, which I have described, violent vomiting and purging takes the place of the convulsions, producing exhaustion almost as rapidly as an attack of cholera. In some of these instances after the patient has been much reduced by the copious evacuations, enough of the urea and elements of a toxic character are carried away with the evacuations from the mucous membranes to relieve the patient temporarily, and he is restored to a better condition than before the attack. The improvement, however, lasts only for one, two or three weeks, when a repetition of the same symptoms may take place exhausting the patient still further, and sometimes ending in fatal collapse. Another mode by which a considerable proportion of these cases terminate after the dropsical effusions have come to pervade the tissues of the body generally, and the urine has become very scanty, is by the supervention of local inflammations; particularly the sudden occurrence of peritonitis, pleuritis or pericarditis, followed by copious effusion into these respective cavities. Perhaps the pleura is more frequently attacked than any other of the serous membranes. From the supervention of acute inflammation in any of these serous surfaces the patient becomes rapidly prostrated; the amount of effusion into the cavity usually so far embarrassing the respiratory and digestive functions as to soon terminate life. In another class of cases without the supervention of any noticeable inflammation, after the general areolar tissues of the body have become thoroughly infiltrated with serous fluid, effusion begins to take place into the serous sacs, and sometimes into the pulmonary tissue, causing hydro-thorax, ascites, sometimes hydrops pericardii, and frequently pulmonary œdema. The latter usually speedily terminates fatally from interference with the oxygenation and decarbonization of the blood. In addition to the symptoms which I have detailed in giving the clinical

history of these cases, from the early stage to the end, it is proper to mention, as of not infrequent occurrence during the more protracted cases, and especially in those which are associated with a considerable degree of dyspnœa from time to time, hypertrophy of the heart, which adds to the tendency to congestion both in the lungs and in the brain. Another very important item connected with the symptoms of these cases is the condition of the urine. From the earliest period in their progress this secretion is found to contain more or less albumen. This is readily made manifest by the ordinary tests of heat and nitric acid. The amount of albumen varies much. In some instances it will be so small through all the early stage of the disease as to cause a mere white cloudiness in the test tube on the application of heat and nitric acid. But when the disease is further advanced the amount of albumen becomes larger, and in many instances will equal one third or one half of the whole bulk of the urine as it settles in the test tube. Usually about in the same proportion as the albumen increases, the natural excretory elements of the urine, urea, etc., diminish in their relative proportion. Upon examination under the microscope the urine presents, in nearly all these cases, cells of renal epithelium, together with hyaline casts, fibrinous shreds and tubular casts, which are fibrinous material molded in the shape of the uriniferous tubules. In the midde and advanced stages of the disease these tubular casts will almost always be more or less dotted over with fat granules.

The three most important items connected with the symptomatology of this form of renal disease, are the appearance of albumen, epithelium and tubular casts in the urine; the supervention of dropsical infiltration, always commencing in the areolar tissue, but influenced much by gravity as to its location; and the retention of urea and effete elements of urine in the blood as indicated by their effects upon the nervous centers and mucous membranes. The tendency of all these cases when thoroughly established, is towards a fatal termination; yet progressing with a very variable degree of rapidity, sometimes there will be intervals of considerable duration in which the symptoms of the disease remain stationary, or improve. This condition excites in the patient more or less the expectation of recovery. Nevertheless it ultimately proves temporary, and is followed by a return of all the more prominent and active symptoms of the disease. Another complication that occasionally makes its appearance in connection with Bright's disease, sometimes early in its progress, but more frequently in the middle and latter stages of advancement, is *amaurosis*, or loss of vision. This occurrence is caused by a retenitis resulting quickly in the formation of white or yellowish stellated spots in the retina, with a considerably increased size of the blood vessels. The stellated spots are regarded as the result of fatty degeneration of the structures.

Anatomical Changes.—Chronic albuminuria or diffuse chronic nephritis when terminating fatally, leaves the kidney, on post-mortem examination in one of the three following conditions: In the first condition the kidney is enlarged, whiter or paler than natural, less dense in texture; the capsule is easily detached. When the organ is laid open and examined minutely, the coats of the smaller arteries are usually found hypertrophied, or thickened, the tubules more or less full and obstructed with tubular casts, evidences of fatty degeneration throughout a large part of the cortical texture, the glomeruli surrounded, many of them, by fibrinous exudation intermingled with fat granules, and generally so altered as to allow of a very free passage of the serum of the blood directly into the urinary tubules. In the second variety the appearances are very similar in all respects to that just

described, with the exception that the cortical portion of the kidney has undergone more of a degenerative change either of a fatty, or amylaceous character. The latter is shown by the characteristic blue tint on the application of iodine, and produces what is usually called the waxy or amylaceous kidney. The third variety presents the typical condition of the kidneys, originally described by Dr. Bright, and to which was originally applied the name of Bright's disease. This change consists in the contraction of the kidneys, causing them to be diminished in size, of a deeper red color, frequently mottled a little upon the exterior, and sometimes showing numerous small, gray, granular specks, or deposits beneath the capsule. When laid open the cut surface presents a red granular appearance, denser than natural, the connective tissue throughout being somewhat hypertrophied. The thickening and hardening of this structure with much fibrinous, fatty and granular material occupying the interstitial spaces in the cortical structure surrounding the glomeruli and malpighian tufts make the condition somewhat analogous to sclerosis, more frequently described as cirrhosis of the liver. Some writers have claimed that these different appearances of the kidney indicate only different stages in the progress of one and the same disease. This, however, is not probable; if it were there would be some uniformity in finding one variety of these appearances in cases that had died early, another variety later, and another still later; but post-mortem examinations connected with the history of cases, do not present any such uniformity or coincidence of one variety of appearances with any particular duration of the disease. And while they are all consequences of some inflammatory action pervading the connective tissue and vascular structure of the kidney their variation does not depend upon the duration or stage of progress so much as it does upon the particular influences, or combination of influences, that have determined the development of the disease, or exerted more or less modifying influence upon its progress.

Diagnosis.—Perhaps the only reliable diagnostic symptoms, or signs of the existence of chronic nephritis are the presence of more or less albumen, coincident with renal epithelium and tubular casts in the urine, taken in direct connection with the preceding gradual failure of strength, pallor of countenance, and more or less of dropsical appearances in the areolar tissue and dependent parts of the body, or of the extremities. The simple appearance of albumen alone in the urine is by no means evidence of chronic nephritis, or any structural change of the kidney. As we have had occasion to point out, when speaking of the different forms of hyperæmia and simple congestion of the kidneys, albumen is of common occurrence in all those conditions in which the capillary vessels of the kidney become more or less overcrowded with blood; whether from active determination of blood to the part, or mere passive accumulations from defective vasomotor influence over the circulation. But when the symptoms of failure in the patient have been gradual, presenting progressively increasing paleness, puffiness of the features, and the albumen becomes a constant element in the urine, associated directly with more or less of the tubular casts and epithelium, there can be little, if any, doubt, about the existence of chronic interstitial, or diffuse nephritis. The practitioner, however, should never be satisfied with the examination of a single specimen of urine. It is better that the specimen to be examined be taken from the urine passed in the morning before the patient has taken food, and then at least two or three specimens be examined at intervals of three or four days.

If, with the general symptoms that I have indicated such examinations show the materials in the urine that I have mentioned, there need be no

doubt or hesitation in pronouncing positively in regard to the diagnosis. It is true, there are many cases so plain that a single examination, in connection with the symptoms, is sufficient to remove all doubt; but this is not generally the case in the earlier stages of the disease.

Prognosis.—Some writers represent the prognosis in chronic nephritis as uniformly unfavorable; the disease in their estimation uniformly terminating ultimately in the death of the patient. My own experience has led me to differ from these conclusions, so far as to regard a considerable number of cases that present all the symptoms that are regarded as necessary to constitute proof of chronic nephritis, as capable of terminating in recovery. I know of no instance of recovery, however, if the disease has existed for a considerable period of time before being brought under judicious treatment; and it is proper to add that the great majority of cases, whether treated early or late, and in the most skillful hands, will eventually reach a fatal result. The cases which have come under my observation, and ultimately terminated favorably, originated during the convalescent stage of the eruptive, or some one of the general fevers. In one instance a case came under my care in the hospital, which had supervened during the convalescence of the patient from typhoid fever, and after the disease had existed for six or seven months recovery took place. In another instance a young man, in whom the disease appeared to originate from long continued exposure to cold and damp in illy ventilated apartments, recovered after the disease had continued between five and six months. I have seen a considerable number of cases following scarlet fever, in which the disease supervened so gradually, with so little active symptoms as to indicate certainly no more active grade of inflammatory action than what would be properly called chronic, in which recovery has taken place after the disease had continued from six to ten weeks. But in nearly all the cases in which the real disease has resulted from intemperate habits or the habitual use of alcoholic beverages, or in connection with constitutional syphilis, or with well marked gouty or scrofulous diathesis, they have proceeded with much uniformity to a fatal result.

Treatment.—In the treatment of all cases of chronic interstitial or diffuse nephritis, the practitioner should have three objects constantly in view, namely, the arrest of the inflammatory process itself by lessening the vascular fullness and irritability of the structure of the kidney; the prevention of the accumulation in the blood of the excretory elements of the urine, thereby avoiding, or postponing as far as possible, the toxic effects of these agents upon the blood, and especially upon the nervous centers; and the palliation or removal of the dropsical accumulations and other complications liable to arise in the progress of the case. For the accomplishment of the first of these objects, the due regulation of the diet, drinks and general hygienic management of the patient is of great importance. All alcoholic beverages, both fermented and distilled, should be rigidly excluded from the patient's use; the diet should consist largely of milk and farinaceous articles, with a limited amount of vegetables and fruit, while meat should be used rather sparingly. As a drink perhaps no article is better than either buttermilk or milk whey. Some mineral waters have been recommended, and in the early stage of the disease I have thought some advantage was derived from having the patient use as freely as convenient such mineral waters as are represented by the Bethesda springs, at Waukesha, in Wisconsin. The patient's clothing should be such as to protect the surface as much as possible from sudden atmospheric impressions, especially cold and damp. Flannel worn next to the skin is best for this purpose, and should be continued throughout

the year. Many patients also derive advantage from a warm alkaline bath, at least twice a week, as warm as can be borne comfortably, with a view of producing exhalation from the cutaneous surface, as well as acting derivatively upon the circulation in the kidneys. The exercise of the patient should be limited; avoiding all attempts at active muscular exercise, sufficient to produce weariness. Frequent riding in the open air, especially in clear weather, is well calculated to maintain appetite and promote the general health of the patient. In addition to these hygienic measures I have certainly seen patients derive much benefit, especially during the earlier stages in the progress of the disease, from the use of the following formula:

℞			
	Potassii Nitratis	15 grams	ʒiv
	Extracti Galii Fluidi	75 c. c.	℥iiss
	Extracti Uvæ Ursi Fluidi	75 "	℥iiss
	Extracti Ergotæ Fluidi	30 "	ʒi

Mix. Of this I have usually given four cubic centimeters (fl. ʒi), mixed with half a wine glass full of sweetened water from three to four times a day. In other instances, more especially those in which the bowels are inclined to costiveness, I have derived some benefit from the use of an infusion of digitalis leaves, holding in solution the bitartrate of potash, given in such doses as the patient will bear without inducing too much effect from the digitalis upon the circulation on the one hand, and without causing excessive looseness of the bowels by the bitartrate upon the other. Most patients will bear profitably six to eight cubic centimeters (fl. ʒss to ʒii) of an infusion, made by placing eight grams (ʒii) of the bitartrate of potassium and the same amount of digitalis leaves in two hundred and sixty centimeters (℥viii) of boiling water, three or four times a day. Both of these formulæ that I have given, have a tendency to increase the elimination of the watery elements of the urine, while they improve the vasomotor influence over the smaller blood vessels and thereby lessen the hyperæmia or congested condition of these vessels in the kidney. Either of the prescriptions may be rendered somewhat anodyne by adding to them a due proportion either of the conium or hyosciamus. If the patient is already showing considerable evidence of anæmia, it will in most instances produce a most beneficial effect, to give from ten to twenty minims of the tincture of the chloride of iron, largely diluted with water, after each meal time. Many recommend also the use of astringents, more particularly tannic, gallic acid, and other vegetable astringents, with a view of lessening, by their action upon the vessels of the kidneys, the excretion of albumen. I have seen many patients to whom this class of remedies have been administered in considerable variety, but I have never known any beneficial results from their use. There is a pretty uniform expression on the part of the writers and teachers in opposition to the use of mercurials in all stages of chronic nephritis. Precisely on what grounds this interdiction rests is seldom stated, and is not very apparent from anything connected with the pathology of the disease. And while I can see no indication for the use of calomel and blue mass, particularly, either for cathartic purposes or for active alterative influences, I must state as a clinical fact, that I have seen in a considerable number of cases of well marked chronic nephritis, often of considerable duration, very much improvement follow the use of small doses of the bichloride of mercury in connection with tonics and a proper regulation of the diet. As long ago as 1848, while residing in the city of New

York, a man in the middle period of life, affected with general dropsy, from chronic nephritis—the urine containing albumen, tubular casts, epithelium and fat granules—came under my care after he had presented himself at one of the college clinics of Dr. Willard Parker, then professor of surgery in the "College of Physicians and Surgeons" of that city, where the case was thoroughly and critically examined and decided to be one of hopeless chronic diffuse nephritis, having its origin in the moderately intemperate habits of the patient. The dropsical effusion had invaded the areolar tissues throughout the whole periphery of the body. The case came under my care as a charity patient, and desiring to make the poor man as comfortable as possible, I put him upon the internal use of bichloride of mercury and tincture of cinchona in such proportion that he would get two milligrams (gr. 1-30) of the bichloride, with four cubic centimeters (fl. 3i) of the tincture of cinchona, diluted with sugar and water, four times a day. At the same time he was directed to prepare an infusion of yellow dock and sarsaparilla roots, with bitartrate of potassium, of which he was to take a wine glass full after each meal. Alcoholic drinks were rigidly prohibited, and a diet consisting mostly of milk, farinaceous articles and vegetables, with only a limited amount of meat, was allowed. Although this case had been in progress for nearly one year since the initial symptoms manifested themselves, and his limbs were so large from œdematous infiltration, that it was difficult for him to walk, his symptoms slowly improved under this treatment until in about three months he was able to go about with facility, and went out of the city into the suburbs, and did some work during the season of cutting hay. Though he did not get well he continued very much improved for more than twelve months after he came under my care; at which time I left the city and subsequently lost all track of the patient. I mention this because it was the first case that came under my care in which I gave the bichloride of mercury. Its administration was founded upon the recommendation of the same remedy in similar cases by one of the most distinguished members of the staff in attendance upon the New York hospital, and from that period up to the present time in purely chronic cases of nephritis, in which there is no direct tendency to irritation of the mucous membrane of the alimentary canal, and the patients are not extremely anæmic, I have certainly seen decided benefit, sometimes amounting to an entire arrest of the progress of the disease for a considerable period of time, and in others to a more effectual retardation than was obtained by the use of any other one remedy. I have never pushed the remedy to the extent of any specific mercurial impression upon the mouth and gums, and I advise that in all instances of its use the effects be noted sufficiently to guard against any such impression or any considerable disturbance of intestinal discharges. But that it sometimes is decidedly beneficial I have had opportunities even within the last few weeks to judge in a case to which I was summoned at a distance in the country, where consultation was had almost exclusively for the purpose of deciding whether mercurials in this form should be used or not. And after the administration of the bichloride in small doses in connection with diuretics and tonics, the patient improved to a very unexpected degree. But I would by no means advise the indiscriminate use of the bichloride in chronic nephritis in any stage of its progress. However, I think its entire prohibition is as injudicious as the prohibition of mercurials in aiding to procure the evacuation of retained excretory matter in many of the cases of acute nephritis. The remedies which are most efficient in accomplishing the second purpose, namely, to prevent such a degree of accumulation of the effete constituents

of the urine as to endanger the development of toxæmic effects in the system, are essentially the same as have been recommended for accomplishing the first. But whenever, either from absence of any treatment or inefficiency of the remedies used, the accumulations of these effete constituents have already increased until they begin to exhibit their effects either upon the nervous structures or mucous membranes, then the question will be how best to effectually promote their elimination, at least to a sufficient degree to ward off the immediate danger of fatal consequences to the patient. Perhaps for immediate relief the administration of a sufficient amount of pilocarpine or of the fluid extract of jaborandi to produce free diaphoresis, will be valuable in many cases, and yet it is necessary to note carefully the degree of debility of the patient, and the danger of producing too much depressing effect upon the circulation by the use of this remedy. The bowels may also be opened freely where they are in any degree constipated, by such remedies as promote copious liquid discharges, as the bitartrate of potassium in combination with jalap, or suitable doses of elaterium. In addition to these and other agents that act freely in promoting eliminations through the alimentary canal, and through the skin, immersing the patient in a warm bath, or in a hot air bath, may also produce some beneficial effect. But in a large proportion of the cases, after urea and other elements of the urine have accumulated to such an extent as to produce a decided impression upon the nervous centers, all remedies that may be used will be found to produce only temporary relief. The toxæmic symptoms return again and again till a fatal result supervenes. When in the progress of the case the continuance of the secretion of the natural elements of urine is sufficient to prevent uræmic poisoning, yet the progressive impoverishment of the blood leads to an increase of the dropsical effusions, until infiltration of the tissue is so universal that not only the areolar tissue but the abdominal cavity becomes filled up, the urinary secretion extremely small, the heart's action more or less weak, and the descent of the diaphragm impeded, rendering respiration imperfect and oppressed, the blood is imperfectly decarbonized, giving the lips a blueish, leaden tint, and is accompanied by more or less coldness of the extremities, drowsiness and yet inability to take the recumbent position, and to sleep on account of the feeling of suffocation. Under such circumstances there is evidently imminent danger of the supervention of œdema of the lungs and death from apnœa, or such a degree of failure in the oxygenation and decarbonization of blood as to produce general paralysis, coma and death from suspended cerebral function. When the patient progresses in this direction till the infiltration begins to crowd upon the chest and render the breathing more or less oppressed, and the use of hydragogue cathartics, diuretics, hot baths and pilocarpine have ceased to ward off further progress, the only resort that has been effectual in my hands in affording relief, has been the making of free incisions into the ankles; not mere punctures as directed by most writers, but one free incision in each ankle, an inch or more long, and deep enough to cut through all layers of fascia down to, or close to the periosteum. Make the incision on the inner part of the ankle, above the internal malleolus. An incision of this kind into each ankle will cause a very free exit of serous fluid. The body and limbs should be placed a little inclined, with oil cloth, or oil silk under the limbs in such a way as to direct the serum into some vessel, and thus prevent the bed-clothes from becoming wet. In most cases it will effectually drain all the tissue of the body in three or four days. I have practiced this in a considerable number of cases with entire success so far as regards the removal of the dropsical

accumulations. And in almost every instance, as soon as the water was fully drained from the tissues, the kidneys resumed an increased elimination of urine, the breathing became full and free, the blood better oxygenated, and the patient apparently took a new lease of life. In two or three cases in which I had supposed that the patients were utterly hopeless, the relief obtained, instead of proving temporary, becam epermanent. The serous fluid usually continues to drain freely through these incisions for several weeks, and if the incisions are well cared for, the limbs kept well washed, the margins of the incisions bathed with a little glycerine, or vaseline every day, it is very rare that they give the patient any trouble from erysipelas, or much pain from heat and smarting. But in most instances they slowly heal, and in from four to eight or ten weeks they will be closed up, and with the exception of three or four cases, to which I have just alluded, the dropsical accumulations slowly return. In cases of this class in which the renal disease remains and increases, and there is consequently a slow return of the dropsical accumulations, the incisions have afforded the patients a number of months of additional life, and I have, in a few instances after they have become again thoroughly filled up, repeated the incisions and thus perpetuated life apparently from three to twelve months longer than it would have otherwise continued. I am well satisfied, however, that one reason why the secretion of the urine diminishes so markedly and ultimately becomes arrested so as to hasten a fatal termination in a large proportion of these cases, is that the pressure of the accumulated dropsical effusion upon the renal vessels, and in some instances more or less actual œdematous infiltration in the renal tissues, constitutes one of the causes for finally suspending the secretory action altogether. And again, whenever by any process the areolar tissues are drained of this fluid, and the circulation in all the capillary vessels throughout this kind of structure in the body, and especially in the periphery, is restored, the pressure upon the vessels and structure of the kidney is relieved somewhat in the same proportion as elsewhere; and it is in consequence of this that there is so uniform an improvement in the secretion of the kidney, which usually lasts for a long time after the patient has been relieved from dropsical accumulations by this mode of tapping. Thorough incisions through all the tissues down to the vicinity of the periosteum in the ankles, with the limbs in a moderately dependent position, almost as certainly drain all the tissues of the body of general œdematous infiltration as the insertion of the trochar into the peritoneum drains the cavity of that membrane of fluids that have accumulated in it. In regard to the treatment of the various complications such as the supervention of pleurisy, peritonitis, cardiac disease, etc., during the progress of marked renal trouble, I have only to remark that they are to be treated on the same principles as we would treat these affections under other circumstances, making due allowance for the general condition of the patient. In most cases, whatever treatment is adopted, proves only palliative, or at best postpones for a brief period, the final result—death of the patient.

LECTURE LIX.

Suppurative Nephritis—Its Causes, Symptoms, Anatomical Changes, Diagnosis, Prognosis, and Treatment.

GENTLEMEN: Under the head of Suppurative Nephritis may be included several affections of the kidneys, differing in their etiology and clinical history, but all accompanied by the formation of pus in the parenchyma of those organs. The causes which lead to suppuration or to the accumulation of pus in the kidneys are various, and the accumulations consequently present several distinct forms. All those conditions of the blood, usually included under the heads of pyæmia and septicæmia are liable to be accompanied by suppurative inflammation or purulent deposits in the kidneys. In this class of cases the pus is usually collected in small but numerous abscesses, varying in size from a pin's head to that of a pea, or several of these small abscesses may be united together forming a larger one the size of a hickory nut. Examination of the kidney in this class of cases shows usually several stages in the progress of this form of disease. In the beginning, the inflammatory process will cause the appearance of white, or yellow spots, which, when examined more closely with the aid of the microscope, will be found to consist of small portions of the renal substance affected with necrosis or death of the cell structure, with generally more or less pus globules recognizable, and in the midst of them a group of bacterial germs. By most writers of the present day, it is supposed that the lodgment of these bacteria from the blood, constitutes the commencement of the disease in the kidney, and that they are the special cause inducing inflammation, necrosis or death of the immediately surrounding tissue and subsequent degeneration into pus. In most cases the same kidney will present all the different stages of progress, from the simple accumulation of groups of bacteria with the first appreciable change or impairment of the tissue in contact with them in some places, more decided death or necrosis of the tissue with pus cells diffused in it in others, and still further, places where the purulent degeneration is more complete, and distinct abscesses have attained a size easily recognizable without magnifying power. In almost all cases arising from pyæmic and septicæmic conditions the renal disease is as I have just described, and results in the formation of numerous small abscesses. There is another class of cases which originate not from general septicæmia, but from inflammation previously existing in other parts of the urinary organs, or in the parts within the pelvis. They occur so frequently in connection with pelvic inflammations after surgical operations upon the urinary organs, that they have been called surgical kidneys. In such the evidences of inflammation in the parenchyma of the kidney is more general; the suppuration takes place more rapidly and ends in the formation of one or more abscesses. Sometimes, indeed, the suppurative processes resulting from previous abscesses and ulcerations in connection with the pelvis or urinary organs, rapidly disorganizes the whole substance of the kidney and ultimately converts it into a purulent mass. And sometimes the suppurative inflammation invades the areolar tissue exterior to the kidney constituting a peri-nephritic suppuration. Perhaps this form of destructive suppurative inflammation in the parenchyma of the kidney is more liable to follow primary abscesses in the prostate gland than in any other part connected with the urinary organs.

Next in frequency is their occurrence after operations for the removal of urinary calculi from the bladder. Another class of cases in some measure intermediate between those connected with pyæmia or septicæmia and the more generally rapid suppurative conditions of the kidney resulting from injuries or surgical operations and abscesses in other portions of the urinary apparatus to which I have alluded, arise mostly from, or in connection with, suppurative pericarditis, or the formation of continuous suppurative processes in the lungs. Suppurative pericarditis itself is not a very frequent affection; but in the larger proportion of the cases that have occurred in which examinations have been made, secondary abscesses have been found in the kidneys sometimes in one, but more frequently in both. There is some liability to the formation of these nephritic abscesses during the progress of any long continued internal suppurative process, in almost any part of the body. In very many of the cases of suppurative nephritis resulting in the formation of abscesses, whether large or small, there is also coincident inflammation in the lining of the pelvis of the kidney, accompanied by the establishment of suppurative processes exterior to the inflamed organs. This is what constitutes a peri-nephritic inflammation, or peri-nephritis. In other instances the inflammation is limited to the lining of the pelvis of the kidney, and does not extend to the parenchyma of the secreting structure. Such cases are denominated pyelitis. And those cases of pyelitis uncomplicated by extension of inflammation to the parenchyma of the kidney, may originate simply from extension of inflammation from the bladder, through the ureters to the pelvis of the kidney, as I have seen in several instances of chronic cystitis. More frequently, however, the pyelitic inflammation has either resulted from ordinary causes, such as exposure to cold and damp, which is followed in a short time by suppuration in the inflamed membrane; or far more frequently, pyelitis originates from the formation of urinary calculi in the pelvis of the kidney, or in the infundibular spaces. The formation of nephritic calculi almost always, sooner or later, gives rise to the establishment of chronic suppurative inflammation in the whole lining membrane of the pelvis of those organs, and not infrequently causes also an obstruction of the ureter by the lodgment of calculi in it, whereby both the urine and muco-purulent material resulting from pyelitic inflammation is prevented from passing into the bladder, and escaping through the urethra, and its retention causes distension of the pelvis first, and subsequently more or less of the ureters, generally giving rise to a swelling sufficient to be easily detected by examination through the abdominal parietes, and distinguished from other tumors.

Symptoms.—There are no local symptoms that usually accompany the formation of pus in those cases of suppurative nephritis arising from septicæmia, or pyæmia, and the existence of such condition of the kidney is only detected by post-mortem examination. The patients of this class are always laboring under the general symptoms of pyæmia or septicæmia, and the establishment of the colonies of bacteria, as the nuclei of numerous small abscesses or collections of pus gives rise to no pains that attract attention from the more general symptoms, nor do they usually so far interfere with the secretion of urine, as to arrest the elimination of urea, and cause the retention of the elements of urine sufficient to produce uræmic poisoning. In some instances where that change in the structure of the kidney is very extensive, there may be a decided diminution in the quantity of the urine, and a sudden development either of convulsions, or the supervention of coma and death. But in the great

majority of instances of this class the result depends not upon the renal disease, but upon the general coincident condition of the system, of which the renal difficulty is only a secondary development. Should the general disease be controlled, and the formations of pus in the kidney be limited to the condition of very minute abscesses, in which the pus is supposed to be capable of undergoing a species of caseous degeneration and partial removal, there is a possibility of the recovery of the patient without permanent impairment of the function of the kidney. In those cases of suppurative inflammation of the kidney depending upon, or secondary to, surgical operations, or primary abscesses in the prostate gland, or in other parts within the pelvis, the lung, or in the course of the urinary passages, there are local symptoms which are more or less distinctive of the renal affection. The patient usually begins to complain of dull, aching, persistent pains in the loins, often extending into the hips and sacrum, accompanied by dry skin, increased frequency of pulse, increased temperature, especially in the afternoon and evening, with sufficient diminution to constitute a perceptible remission in the morning. There is much restlessness on the part of the patient, scantiness of urine, frequently causing heat and burning on passing it, and in from two to five days there usually occur decided chills, followed by brief paroxysms of high fever and copious sweating. On the supervention of the chills and sweats the pulse becomes smaller and more frequent, the temperature, especially during the afternoon and evening, rises higher, when the patient becomes more or less incoherent or troubled with dreams. The urinary secretion may be small or it may be nearly natural in quantity, but it becomes now mixed with pus, which gives it a slightly turbid appearance when it is passed, but on allowing it to stand falls as a layer of whitish matter at the bottom of the vessel. Microscopic examination shows it to be made up almost entirely of pus mingled with some renal epithelial cells, and sometimes red corpuscles of blood. The patient rapidly loses flesh and strength, and in some instances the proportion of urea in the urine is very much diminished. In such cases the stomach becomes excessively irritable, causing the prompt rejection of everything that is taken upon it, whether food, drink or medicine. The progress of such cases from this time on is very variable, as regards duration. In some instances which have come under my observation, the patients presented daily the phenomena of the regular hectic type of general fever, with progressive emaciation and total inability to retain anything upon the stomach, much of what was taken regurgitating without the act of vomiting. The intestines remaining entirely empty, become contracted, while the urine is constantly impregnated with a considerable quantity of pus, and death takes place from simple asthenia, at the end of from three weeks to three months. In other instances, however, as the disease progresses the destruction of the renal tissue becomes so great as to prevent the elimination of the natural effete elements of urine and their retention in the blood causes toxic effects upon the brain and nervous centers, bringing on the usual muscular twitchings, more or less convulsive movements, coma and death. Such cases usually progress much slower than those I have just previously mentioned. In addition to the symptoms that I have already mentioned in the cases of more general suppurative inflammation, the kidney, usually, after the first three or four days, becomes enlarged sufficient to be detected by examination, and sometimes it attains a size sufficient to present a distinct tumor, which can be easily included between the fingers of one hand placed underneath the eleventh or twelfth ribs posteriorly, and those of the other placed directly under

the margin of the ribs opposite the angle of the colon on either side anteriorly. The shape of the tumor thus included between the two hands may be traced sufficiently to clearly indicate its origin as distinguished from that of enlargement of the spleen or any accumulations within the angles or sigmoid flexure of the colon. The formation of such a tumor or swelling accompanied by a greater or less amount of pus intimately intermixed with the urine as it is passed, separating when the urine is allowed to stand, is sufficiently diagnostic of suppurative renal disease. When the inflammation and suppuration occur exterior to the kidney as in perinephritic suppuration, the general course of the symptoms is very nearly the same, and may present more or less of a tumor locally, but it will differ in the fact that there will be little or no appearance of pus in the urine unless there be coincident suppuration in the kidney at the same time, as sometimes happens. In a case that came under my own observation not very long since, in which all the symptoms of suppurative nephritis of an acute and severe character were present, the post-mortem revealed the fact, not only that the parenchyma of the kidney in the left side was almost entirely disorganized, and converted into pus, but a considerable collection of pus also existed exterior to the kidney constituting an abscess between it and the lumbar muscles. In this same case there were one or two small collections of pus in the parenchyma of the opposite kidney. The primary disease was dependent on inflammation and suppuration in the prostate arising from a contusion in the perinæum. When the suppurative inflammation attacks simply the mucous membrane lining the pelvis of the kidney constituting pyelitis, the general symptoms are less severe. Indeed, there is generally little or no febrile disturbance or increased temperature, and but little acceleration of the pulse, but there is in most instances dull, aching pains in the loins, generally increased by standing or walking, some degree of tenderness to pressure underneath the margin of the ribs in the lumbar and lateral spaces in the direction of the kidneys. And after the disease has advanced a short time there is more or less distension of the pelvis of the kidneys which may be felt as a tumor or swelling projecting below the margin of the ribs, or between the margin and the anterior crest of the ilium, coincident with decided increased fullness or tumefaction posteriorly in the lumbar region. Pyelitis existing alone without involving the structure of the kidney is manifest, however, more by the condition of the urine, than by either general or local symptoms. In nearly all such cases the urine, though showing but little alteration from its natural appearance when voided, yet when allowed to stand will generally deposit more or less mucus in the early stage, subsequently muco-purulent material, and in the later stages much pure pus. When the pelvis of one kidney is affected there will be frequently days and parts of days when the urine that is voided will appear perfectly natural, neither depositing muco-purulent material nor exhibiting any deviation from the natural condition. And if attention is given closely to the patient it will be found that at such times the tumefaction and swelling on the affected side has steadily increased, and is usually accompanied by increased heaviness or weight and dull pain in the lumbar and iliac regions, and in one or two days, sometimes three, the urine will become suddenly more copious, looking a little turbid when passed, and depositing, on standing, large quantities of pus and muco-purulent material with diminution in the fullness of the side, and more or less relief to the dull pain and sense of weight that had previously existed. The explanation of this occurrence is, that in pyelitis, the thicker portions of the pus and muco-purulent material are liable to lodge in the ureters and pro-

duce temporary obstructions to the passage of urine, or of the products of the inflammation, causing them to accumulate till the pelvis is more distended, giving rise to a greater amount of fullness, weight, and dull pain, and as the urine is entirely obstructed from the diseased part, the patient voids only the urine from the healthy kidney, and consequently it presents the natural color and appearance, at the same time that the symptoms of trouble upon the other side in all other respects are aggravated. As the pressure accumulates, the obstruction in the ureter is forced through into the bladder, allowing again a discharge of the contents of the pelvis, consequent lessening of the tumefaction, and more or less relief to the pain, while the urine coincidently becomes very much impregnated with inflammatory products consisting of mucus, pus and not infrequently red blood corpuscles. When pyelitis originates from causes not involving the formation of urinary calculi, there may be at no stage in its progress, red blood corpuscles in the urine but only mucus and pus; and these will vary much in their relative proportions as well as in their absolute quantity. But when the pyelitis has been caused by the prior formation of renal calculi, there are very few instances in which there is not at times hemorrhage sufficient to make blood quite manifest in the urine when voided. There are some cases, however, of this variety in which the calculi are numerous, varying much in their size, one or more of them too large to engage in the ureters at all, but being retained in the pelvis of the kidney, others of such size that they actually engage in the ureters and pass through it, producing during the passage more or less severe pain, sometimes excruciatingly severe, which ceases abruptly as soon as the calculus passes from the ureter into the bladder constituting what has been described as nephritic colic. At other times the calculus after passing into the ureter becomes arrested at some stage of its progress, is retained there, constituting a permanent obstruction to the flow of the urine through that duct into the bladder. These cases of accumulation of urine and purulent material in the pelvis of the kidney and in the ureter often distend both so that the ureter itself above the point of obstruction becomes dilated into a sac presenting all the outlines of a tumor of considerable size in that part of the abdomen. When the calculi thus become permanently lodged in any part of the ureter from its renal extremity to its entrance into the bladder the resulting enlargements may be very various.

In some instances it will be limited almost entirely to dilatation of the urethra itself, which becomes dilated into a sac sometimes two or three inches in diameter, while the pelvis of the kidney remains but little distended. A case of this kind came under my observation in the capacity of consulting physician some years since, in which an obscure urinary affection had existed a long time, and a tumor had formed directly in the course of the ureter of the right side. The tumor was of an oblong form commencing low enough to make it difficult to get at its lower extremity with the ends of the fingers between it and the ramus of the pubes; while the upper portion could be easily outlined with the fingers, showing an enlargement about three or four inches in length and at least two inches in diameter at its largest part. This oblong tumor lying in the right side of the abdomen directly in the course of the ureter, and equally in the region of the ascending colon led his attending physician into much doubt in regard to the nature of the disease. The case ultimately terminated fatally, and in the post-mortem examination it was found that a renal calculus had become permanently arrested in the ureter, within one inch and a half of the opening of that tube into the bladder, and had appar-

ently produced complete obstruction to the passage of urine and all other matters through that duct. This obstruction had resulted in dilatation of the ureter into a sac or tumor of the dimensions I have mentioned, in the right side of the abdomen. The pelvis of the kidney was somewhat dilated and contained several other additional calculi, the largest of which was the size of a hickory nut. Most of these cases belong directly within the domain of surgery, and we need not pursue them further than to give you a general outline of their progress and such symptoms as will enable you to diagnosticate them from other forms of disease. As I have already stated, pyelitis may occur and continue an indefinite period of time, as a chronic suppurative affection of the lining of the pelvis of the kidney, without involving other parts. In very many cases of pyelitis, there is coincident cystitis. Inflammation in both pelvis and bladder arises from the same causes, and leads to very similar results.

Anatomical Changes.—I have already spoken of the anatomical changes which take place in the pyæmic collections of pus in the kidney, where the purulent formations are the result apparently of colonies of bacteria deposited in the progress of general pyæmic or septicæmic conditions of the blood. Whether the bacteria are the real cause of the inflammation and suppuration here, or whether they are only coincident, it is not easy to determine. The prevalent opinion is that they are the special cause of the rapid degeneration of tissue, and the formation of small multiple abscesses. In the suppuration which takes places in the kidney in the progress of suppurative pericarditis, abscesses in the lungs, or extensive suppurative conditions in other portions of the system, it is probable that the renal affection originates directly from the passage through the blood of the emboli, or particles of matter detached from the suppurative surfaces just named, and their lodgment in the minuter vessels of the cortical texture of the kidney. Such emboli plug up the renal vessels, and create irritation, which leads to rapidly suppurative inflammation, and consequent formation of pus. This may be confined to a limited space resulting in a single abscess, or there may be many points of obstruction and suppuration, and in their development they may unite more or less together, until a large portion of the renal substance becomes converted into pus. In most cases where examinations have been made with care, the embolic obstructions that occur in this class, contain also, more or less of colonies of bacteria or micrococci, which probably bear the same relation to the suppurative processes here, that those connected with the septicæmic cases to which I have previously alluded, bear to them. It is proper to state, that in the embolic deposits not infrequently, some degree of extravasation of blood or minute hemorrhagic exudations take place, in the early part of all obstructions; and these may sometimes be detected on examination, in the places that have undergone the least change, while in others where suppuration is more complete and extensive, these hemorrhagic exudations are unnoticeable.

Diagnosis.—As I have already remarked there are no symptoms noticeable during the lifetime of the patient by which a diagnosis of the cases connected with pyæmia can be made, or at least a large proportion of them; while in other cases to which I have alluded, the more extensive formation of pus causes early impregnation of the urine with purulent material. In these, the diagnosis can almost always be made by noticing, first, the occurrence of pain and heaviness in the region of one or both kidneys, followed by more or less irregular chills and sweats, with the formation of a tumor consisting of the enlargement of one or both kidneys, and the appearance of pus in the urine,

when examined under the microscope. The coincidence of these circumstances render the diagnosis of this class of cases sufficiently certain. There are some cases of pyelitis in which there is more difficulty in arriving at a certain diagnosis between pyelitic disease and cystitis. You must recollect, however, that in cystitis the muco-purulent material is always less intimately intermixed with the urine as it is voided, and that there is an inclination to void the urine much more frequently than natural with correspondingly less at a time, and micturition is accompanied by more or less burning, smarting pain, and some degree of pressure:—whereas, in pyelitis uncomplicated by cystitis, the patient generally voids urine not more frequently than in the natural condition, and in thus voiding it, the muco-purulent material is so intimately intermixed with the urine as to give it a more clouded appearance but is not recognizable as a separate material by the eye, until it has been allowed to stand usually for an hour or more. There is also in uncomplicated pyelitis, absence of the sharp, smarting pain in voiding the urine, and of the sensation of irritation in the urethra or neck of the bladder. If there are exceptions to this it is when the pyelitis is accompanied by urinary calculi, and some of the smaller calculi occasionally passing into the bladder may give rise, before they pass out through the urethra, to sufficient irritation to cause pains similar to those of cystitis. But if such pains occur from that cause they will occur only occasionally, while in the intermediate time urine passes without burning, and without frequency, and yet contains an abundance of pus. Such cases seldom exist for a length of time without developing more or less enlargement of the pelvis of the kidney and consequently a perceptible tumor in that region which serves to render the diagnosis also more complete. Many have claimed that there is a difference in the appearance of the epithelium derived from the pelvis of the kidney, when in a state of chronic inflammation, from that detached from the surface of the bladder in cystitis. It is quite evident, however, that there is not such a degree of real difference in these cases as to be of any value in diagnosis. But as I have previously remarked, cystitis and pyelitis frequently exist coincidently, when the symptoms, phenomena, and consequences of both are present at the same time. In such cases there will be an intermingling of the symptoms of both, and unless the pelvis of the kidney is enlarged sufficiently to present a recognizable tumefaction to aid you, it may be impossible to decide positively whether you have a case of cystitis alone or of cystitis and pyelitis together. Practically, however, it is unimportant.

Prognosis.—The prognosis in all cases of suppurative inflammation in the parenchyma of the kidney must be regarded as more or less unfavorable. For while it is true that a few instances are on record in which peri-nephritic suppuration has taken place, and by freely opening the abscess from behind the peritoneum and establishing drainage, patients have recovered; and in very rare instances when the suppuration has existed in the substance of the kidney and a discharge of pus has taken place with sufficient freedom into the pelvis and through the urinary passages with the urine to drain the abscess and lead to ultimate recovery, or an incision carried in the same manner as for peri-nephritic abscess boldly into the kidney itself, has resulted in the drainage of the abscess through the exterior with favorable results; yet these are rare exceptions when compared with the general rule, which is, that these suppurative conditions of the kidney all end the life of the patients. If it be practicable, as I have before suggested, that those numerous points of suppuration which take place in the kidneys during septicæmic and pyæmic conditions of the

system should undergo such changes as to ultimately allow repair of the structure of the kidney and avoid death from renal degeneration, yet the great majority of patients of that class actually die from the general disease before such reparation has had time to take place in the kidney.

Treatment.—But few words are necessary in regard to the medical treatment of all these different varieties of suppurative disease of the kidney. Those which originate in connection with pyæmia and septicæmia are to be treated entirely in accordance with the indications afforded by the general disease. The same may be said of those cases which originate in connection with abscesses in the lungs, or suppurative pericarditis, or extensive suppurative processes in any other parts of the system. The renal affection being secondary entirely may hasten the fatal result, but does not alter the fact that the indications for treatment are covered by the morbid conditions and processes which had existed prior to its occurrence. If cases of diffuse suppurative inflammation occur as the result of direct blows, injuries, or from any causes that render the renal affection the primary one, it is probable that treatment promptly resorted to of the same character which I have mentioned as applicable for acute nephritis in its early stage, would be most likely to relieve the patient, by either preventing or lessening the extension of the suppurative process. But in these cases, the stage preceding the suppurative process is short; and oftentimes is passed before the attention of the physician is attracted to the case, or the true diagnosis has been made. But when suppuration is once established, the great object of the treatment must be to sustain the patient by judicious use of nourishment, and when, as is often the case the stomach refuses to accept or retain food, nutritive enemas must be substituted. Such remedies as are calculated to sustain the patient mort or less, and can be used hypodermically, may be employed in that manner Something may be done by inunction or the introduction of nutrimen through the skin. All these modes may be resorted to for the support of the patient and prolongation of life, in the hope that the accumulation of pus will either be relieved spontaneously through free discharge into the pelvis of the kidney and through the urinary passages with the urine, or that it may assume such a position or relation as to be reached by incision from the exterior behind the peritoneum, and allow of drainage in that way. But you will perceive that these measures at once bring the case within the domain of practical surgery, where you must look for detailed directions for such operative procedures. In cases of pyelitis arising from the existence of calculi in the pelvis of the kidney, the treatment must consist in the administration of such remedies as are calculated to allay irritation in the mucous membrane of the urinary passages generally; such tonics and nutrients as promote the general nutrition and strength of the patient, avoiding exercise, especially upon the feet, or in the upright position, which is calculated by the free motion of the calculi to add to the irritation and often to occasion hemorrhage. If in the progress of the case such symptoms are developed as render the diagnosis reasonably certain that such calculi exist, and have become too large to be voided, it brings the important question, whether the operation of nephrotomy, by which the calculi may be reached and removed shall be ventured upon or not. Where there is but a single large calculus free to move in the pelvis of the kidney, and the patient is of good constitution, the surgeon may undertake an operation for its removal with reasonably fair prospect of success, as it constitutes probably the only hope of preserving the patient from a long, wasting, painful sickness and ultimate death. As there are no remedial agents known that are capable of dis-

solving these calculi, their continued presence sooner or later exhausts the patient and leads to coincident affections which shorten life.

LECTURE LX.

Fluxes—Definition and Varieties—Cutaneous Flux, or Diaphoresis—Its Causes, Pathology and Treatment.

GENTLEMEN: In the sixth lecture of the present course while speaking of the classification of diseases, or their arrangement into convenient groups to secure order in their consideration, I arranged those denominated local diseases in four sub-classes or orders, namely: inflammations, fluxes, neuroses and a group of miscellaneous affections. Having completed the consideration of those classes denominated local inflammations, so far as they come within the scope of what is regarded, at the present day, as practical medicine, I now invite your attention to the diseases and morbid conditions included in the second division under the designation of fluxes. You will remember, that in the lecture just alluded to, I stated that this term was not an entirely satisfactory one, having relation only to a symptom which may be common to all the morbid conditions included under that designation, and having no pathological significance on the one hand, and no indications as to the particular organs or tissues that might be involved in the disease upon the other. And yet, as all the diseases included in the group are characterized by an unusual flux or flow of fluids, I am not able to select a better term. In the lecture to which I have alluded, you will find a table in which the diseases and morbid conditions included in this division are arranged, first into two groups; the one characterized by the flow of serous fluids derived from the blood, and hence called serous fluxes; and the other characterized by the flow of blood itself, and hence called sanguineous fluxes or hemorrhages. (See page 51). The serous fluxes were again divided into two groups, the one taking place from the free surfaces, and the other into shut sacs or interstitial spaces of tissue. As the free surfaces of the body are made up or constituted mainly of the cutaneous tissue upon the exterior surface of the body, and of the mucous membrane lining the alimentary canal and other cavities having external outlets, the flow from these surfaces is at once discharged instead of accumulating in contact with any part of the body. When the flow is from the cutaneous surface exteriorly, it takes the name of diaphoresis, or sweating. When it takes place from the internal free surface of the mucous membrane of the alimentary canal, it gives rise to discharges either by vomiting, purging, or both, and is generally recognized as serous diarrhœa, cholera morbus, cholera infantum or epidemic cholera, according to the rapidity and copiousness of the discharge. When the flow of serous fluid takes place into the shut sacs like the membranes of the brain, pleura, pericardium, peritoneum, synovial membranes, bursal sacs, or into the parenchyma of organs, it has no way to escape except by absorption, and consequently accumulates, distending the parts, constituting what is known as dropsical accumulations. It then takes various names, indicated

in a great measure by the name of the sac in which it may accumulate, as hydrocephalus, hydrothorax, ascites, and when in the interstitial spaces, œdema or anasarca. In the consideration of this group of diseases, I shall follow the order in which they were presented in the table given in the sixth lecture to which I have already alluded, and will consequently direct your attention first to the fluxes from the free surfaces of the body.

Diaphoresis.—The eliminations from the cutaneous surface, passing as they leave, from the fluid to the vaporized form, accomplish, in the healthy condition of the system, two important purposes. One is excretory, freeing the blood from certain portions of the waste materials that have been derived from the molecular processes in the tissues of the body, and the other is to diminish the temperature by constantly converting a portion of the free heat into a latent condition in the conversion of the fluid on the surface into the æriform state. Cutaneous exhalation, therefore, constitutes an active cooling process, provided by nature for counterbalancing the tendency to accumulate heat by the constant conversion of latent into free heat in the different processes taking place in the living tissues. The quantity of exhalation from the cutaneous surface varies much within the limits of health.

As a rule, it may be said that the amount of exhalation from the cutaneous surface, in the healthy condition, is in direct ratio to the temperature of the surrounding atmosphere, provided the hygrometric condition or that of moisture be the same. But a dry atmosphere at the same temperature invites a much more rapid exhalation than a moist one, from the simple physical fact that the atmosphere is capable of holding only a certain amount of aqueous vapor in solution before it reaches the point of saturation. Hence, an individual can maintain health in a dry atmosphere, at a much higher temperature than in a moist one; as the experience of each one of you has demonstrated, if you remember the difference in the effects of two summer days of the same temperature as indicated by the thermometer, but in one of which the air is dry, in the other the air is saturated with moisture. The comfort, and even buoyancy in the first, contrasts strongly with the oppressive character of the second. I call your attention to these circumstances relating to health and every-day life, that you may the better appreciate not only the function of the cutaneous tissue so far as relates to exhalations or fluxes from it, and the natural effects which are produced, but also the morbid conditions and their remedies. For while the cutaneous exhalation may vary much in quantity in a given time within the limits of health, if it is out of correspondence with the relations of the surrounding atmosphere, it is frequently indicative of some pathological condition needing correction. Without going minutely into details, in regard to all the causes that influence exhalations from the surface of a morbid character, we may group them into three divisions: First, those which simply increase the temperature of the surrounding medium. Second, those that produce impairment of the general tonicity by lessening the vital affinity of the tissues, including the cutaneous, and thereby inducing such general relaxation as to favor excessive exhalation of the watery or serous element of the blood through any of the free surfaces of the body. And, third, those causes that act more directly upon the vasomotor nerves controlling the vessels of the periphery or surface of the body. In regard to the cases that arise from the first of these causes, namely, the direct increase of the temperature of the surrounding medium or atmosphere, I may point you, as the most familiar illustration, to the effects of the high temperature of every sum-

mer. As I have before stated, all other things being equal, the higher the temperature of the air in which we live, the greater is the amount of cutaneous transpiration. An excess of such exhalation rapidly diminishes both the saline and watery elements of the blood. For, as you are aware, the perspiration contains an important amount of the saline constituents, especially chloride of sodium, which is an important element in healthy blood. It is a physiological law, that whenever from any process the watery element of the blood escapes in too large proportion, it leads to a demand for drink, or thirst for fluids on the part of the patient. Consequently, the general habit of the community during the warm season of the year, while perspiration is going on sufficiently active to prove a source of exhaustion of the water and saline elements of the blood, is, to take proportionately larger amounts of water, or of some kind of diluent fluid to supply the place of such exhalation. As a general rule, however, the more copious the supply of fluids by drink, the more copious also will be the cutaneous transpiration. The result is, that a large part of the community during the highest temperature of summer, by the quantity of water and other fluids they drink, directly encourage the flow of the cutaneous exhalation, which carries with it a much larger proportion of the saline elements of the blood, especially the chlorine salts, than are supplied by the water and liquids that are taken; and the consequence is, that the blood is kept deficient in its free salts. It was long ago ascertained by Bernard, and since confirmed by many others, that the capacity of the blood to take up oxygen from the air cells of the lungs and hold it in solution to be distributed through the system with the arterial blood, depends in part, at least, upon the saline constituents existing in the serum. You can readily see, therefore, that whenever the saline elements, and more especially the chlorine salts of the blood, are diminished below their natural proportion, it also diminishes the capacity of the blood for receiving oxygen from the air cells of the lungs, and consequently, diminishes the efficiency of the process of oxygenation and decarbonization of that fluid. The result of such deficiency is, that the nervous system feels the depression, consequent on the presence of defectively arterialized blood, giving rise to a sense of weakness, weariness and inability for active exertion. At the same time the gastric tubules and other secreting cell structures in different organs, feel the want of a more fully arterialized blood, and consequently fail to maintain the healthy performance of their natural functions.

The appetite becomes impaired, the food digests less readily from the diminished amount of gastric secretion, causing gastric and intestinal derangements; and it is in this way that we have a full and satisfactory explanation of the large amount of minor ailments that are so prevalent in the community during the heat of every summer. And in certain classes of the community, those especially who are working at all seasons of the year in places exposed to a very high temperature, as is the case with some of the workmen in iron foundries, rolling mills and manufacturing establishments requiring the presence of high heat, copious perspiration causing dryness of the mouth and craving for drink, induces a very copious supply of fluids. I have had occasion every year, for many years, to examine and prescribe for workmen from such places in this city, who, under the circumstances, had acquired the habit of drinking from six to twelve *litres* (quarts) of water or other diluent drinks every day during the regular hours that they were exposed to a high temperature; and at the same time perspired so copiously as to fully counterbalance the amount of their drink. The result has been such as I have mentioned, a

few moments since; the exhaustion of the free salts of the blood, diminished oxygenation and decarbonization, leaving the skin clammy and cool, the countenance haggard, the lips a leaden hue, under the finger nails more or less bluish or leaden, extreme weakness and almost total suspension of gastric secretion and digestion, with marked diminution in the quantity of urine. It is not only this class, however, that suffer, although they give us the most complete demonstration of the extreme derangements produced by this process, but there are thousands engaged in no work as well as those who are busy during the summer season, that follow the habit of indulging so largely in drinks as to keep up excessive exhalations from the surface with the same consequences I have detailed, varying only in their degree.

Of course the treatment which such patients require, consists mainly in the proper regulation of their diet and drinks. I have found by an abundant trial, that nearly all acute cases of the fluxes liable to result from these causes, whether it be from the high heat of summer, or by exposure to the high temperature of certain kinds of work, can be avoided by the simple rule, that the patient, after taking such an amount of water, milk and water, or other simple diluents, as weak tea or weak coffee, at the time he takes his food as he may desire, between the meals, he shall never take more than thirty or sixty centimeters (fl. ℥i or ℥ii) at one time. Such drink may be either cold water, milk whey, buttermilk, or water slightly acidulated with acetic acid and flavored with a little syrup. As often as the mouth becomes dry and uncomfortable, taking for drink simply this small quantity of cold water, or any of the other drinks I have mentioned, moistens the membranes of the mouth, fauces and œsophagus and produces a cooling impression upon the stomach, which continues just as long as would be the case, if they took half a litre (or pint) of a similar fluid at once. The quantity taken does not alter the time at which the feeling or desire for more drink is reproduced. But by limiting the amount taken at any one time, directly to the quantities I have specified, most individuals would consume no more than half a litre or one pint in the interval between breakfast and dinner, and a similar quantity between dinner and supper. The consequence is, that under such a rule in regard to drinks, the amount of exhalation from the cutaneous surface is greatly diminished. The free salts of the blood are consequently retained, and the blood maintains very nearly its natural proportion of constituents throughout. The strength of the individual is also conserved, the secretions are maintained in their natural condition. I have given the rule to a great many, who had been suffering from the conditions I have mentioned, and I have yet to find a single individual practicing it faithfully, who has not thereby obviated all the evil effects from which they had previously suffered. It is now more than thirty years since my attention has been directed to this particular subject, and I am satisfied that a very large percentage of the minor ailments of every summer, and also many of the more severe attacks of cholera morbus and diarrhœa, originate from the influences to which I have been alluding. It is hardly necessary for me to say that the evil effects of drinking large quantities of water, and other diluent drinks in the encouragement of perspiration and loss of a large proportion of the saline elements of the blood, are in no wise lessened by the mixture of alcoholic beverages with the water or other diluents that are taken. In other words, that a little whisky or brandy will in no wise mitigate the evil, but on the contrary the mixture of alcohol in any form, whether as distilled or fermented liquors, directly and positively adds to the evil by

still further diminishing the oxygenation and decarbonization of the blood. Indeed, I have never found the water in any part of the world so bad, but that the addition of alcohol would make it worse for drinking purposes.

The second group of causes to which I have alluded, namely, those which produce excessive exhalation from the surface by causing relaxation or impairment of the general tonicity of the tissues are chiefly connected with, or dependent upon, previously existing diseases, such as the extreme impoverishment of the tissues in the progress of consumption, chronic diarrhœa, chronic dysentery, the collapsing stage of acute general diseases, and of choleraic affections. You will learn as you watch at the bedside, that the last stages of almost all general diseases of an acute character, and of those local affections that cause death by asthenia or exhaustion, that the patient reaches a stage before actual dissolution in which the tissues become so impaired by the predominance of waste over that of nutrition, that there is an almost constant tendency to excessive exhalation from the whole cutaneous surface, usually giving it a cold, clammy feeling, at the same time it is bathed with an exudation of the watery element of the blood standing in drops upon the surface. This is well known as the colliquative or cold perspiration that betokens the speedy coming of death, and yet, it sometimes exists for days before the final cessation of life. However, in many of these cases coincidently with the relaxation of the surface and excessive exhalation, the free surface of the internal mucous membrane becomes similarly relaxed, and a colliquative diarrhœa goes on parri-passu with the excessive diaphoresis until the muscular structures, no longer controlled by the involuntary nerve force, relax as indicated by the failure of the sphincters, and the appearance of the involuntary discharges that precede death. How far the serous diarrhœas that take place in young children so generally, especially in the more densely populated districts and cities during the highest heat of every summer and the more severe attacks of cholera morbus are dependent directly upon the relaxing influence of continuous high temperature, is perhaps difficult to determine. That it is this influence of high temperature continuing day and night for a succession of days, that exerts a very important influence, I shall have occasion to demonstrate to you by an abundant array of facts when I come to consider more in detail these diseases.

The third group of causes to which I alluded as capable of producing excessive diaphoresis, were those which operate through the vasomotor nervous system chiefly, if not exclusively. That there are agents which may thus act is easily demonstrated by watching the operation of certain medicines. The prompt effect of pilocarpine in so modifying the condition of the cutaneous vessels and the salivary glands as to cause copious exudation of fluid from both, giving free diaphoresis and excessive flow of saliva, and the almost equally prompt manner in which belladonna and various other agents are capable of producing exactly the reverse effect, so altering the cutaneous capillaries and those of the mucous membrane and glandular structures belonging to the mouth, as to arrest transpiration from the one and secretion from the other almost totally, show that these functions are capable of being acted upon by special agents, both in the direction of inducing excessive diaphoresis on the one hand, and of almost entirely arresting exhalations on the other. And it is probable that a large number of cases are met with in practice, characterized by excessive sweating, whether in the sweating stage of periodical fevers, or the copious sweats of hectic fever, or the almost hourly vacillations from chilliness, dryness and free sweating that we see in some patients in

particular periods of life, more especially in the female during transition from the continuance of the menstrual flow to that of their final cessation, and sometimes for a year following its final discontinuance, and of some others that might be named, which are specimens of excessive cutaneous transpiration, undoubtedly directly dependent upon modifications of the vasomotor influence over the cutaneous vessels. It is true, that in all those cases which occur in connection with general fevers, or with hectic, septicæmic or pyæmic conditions, the treatment must be principally that which is necessary and proper for the existing disease on which the cutaneous transpiration depends, and with which it is connected as an incident. You will meet with numerous cases, especially those which occur in connection with wasting disease of the hectic type inducing exhaustive night sweats, as well as those less important but much more numerous, occurring at the period of change of life, as it is termed, in which you will find it necessary to prescribe not only for the general condition, but for the purpose of directly influencing this particular symptom.

In all cases, attention should be given fully and carefully to the condition of all the functions of the patient, and in directing treatment, such directions should be given as are calculated to correct whatever is manifestly out of order. In those cases which occur at the period of change of life in females, the remedies that I have found most efficient for removing the cutaneous relaxation and sweats, which so inconvenience many of these patients, by causing alternate chills and sweating at short intervals, many times every day, are, a combination in the form of pill or capsule, of the oxide of zinc, ergotin, and extract of scutilaria, in the proportion of two decigrams (gr. iii) of the oxide of zinc, and six centigrams (gr. i) each, of the ergotin and extract of scutilaria, in a capsule; one of which may be given each morning, noon and night. If the bowels are habitually inclined to be costive, as is often the case in these patients, the addition of two centigrams (gr $\frac{1}{3}$) of pulverized aloes or extract of colocynth to each capsule, will usually obviate this difficulty, without interfering with the beneficial influence of the other constituents in any degree. For the excessive diaphoresis usually indicated by the frequent night sweats existing in connection with suppurative conditions in the lungs, or any other parts of the body, we may use with advantage oftentimes three classes of remedies, namely: those which are calculated to lessen the suppurative process, and thereby retard the progress of the primary disease and its consequences; such tonics as increase the general tonicity of the tissues, thereby lessening the relaxation of the surface; and such direct vasomotor tonics as increase the tone of the vessels of the periphery, and more directly and immediately prevent the occurrence of the periodical sweats. Among the first of these remedies I have found none more efficient than a combination of pure glycerine and the syrup of iodide of iron for lessening suppuration in the advanced stage of phthisis, with profuse night sweats, and in many other internal suppurations.

I have usually mixed these constituents in the proportion of four parts of pure glycerine, with one of the syrup of the iodide of iron, giving to adults from two to four cubic centimeters (fl. ʒss to ʒi) of the mixture, largely diluted with water, from three to four times in the twenty-four hours. I have seen many cases in which the amount of pus formed was much diminished during the use of this combination, and coincidently the night sweats were also correspondingly mitigated. Another combination, which produces a similar though not quite as active an effect in

these suppurative conditions, is that of sub-nitrate of bismuth, sub-carbonate of iron, and minute doses of morphine or codeine. This is particularly applicable to the suppurative stage of tuberculosis, after the patient has become exhausted to such a degree as to induce more or less irritability of the stomach and diarrhœa as well as night sweats. But for the immediate control of the copious sweats of all forms of hectic as well as many of the more important toxic conditions that are accompanied by profuse perspiration, I have found no remedies that were equal to ergotin when given in doses of two decigrams (gr. iii) three times a day; or the extract of belladonna, given in just such doses as the patient will bear without producing uncomfortable dryness of the mouth and fauces, or impairment of vision by dilatation of the pupil of the eye. But the ergotin has succeeded in my hands more satisfactorily, for this particular purpose than any other remedy that I have used. It is unnecessary, however, to consume your time by further details in regard to the etiology and treatment of excessive fluxes from the cutaneous surface, because the remarks which I have already made, concerning the *modus operandi* by which remedies act in the production of excessive diaphoresis, and the different modes by which remedies may be brought to bear, either as tonics upon the general system, or as special agents for improving particular functions, and still more particularly as vasomotor agents in acting directly, at such times as we may use them, upon the condition of the circulation in the periphery, you will see clearly the principle on which you can act in any and all cases that may come before you for consideration. I will consequently leave this class of cases and next direct your attention to the fluxes from the free surfaces within, or more particularly from the mucous membrane of the alimentary canal, considering them under the names of serous diarrhœa, cholera morbus, including the cholera morbus of children, which is more generally styled cholera infantum and epidemic cholera.

LECTURE LXI.

Serous Fluxes from the Mucous Membrane of the Alimentary Canal—Serous Diarrhœa—Cholera Morbus, and Epidemic Cholera; their General History and Etiological Relations.

GENTLEMEN: The group of affections included under the heads of serous diarrhœa or "summer complaint"—and cholera morbus—prevail most in the middle part of the temperate zone. In this country that part lying between the 31° and 42° parallels of latitude and east of the Rocky Mountains, gives a much higher ratio of their prevalence, than the parts further north or south or on the Pacific coast. It is within the belt first named that we have the greatest range of temperature, the difference between the coldest days of winter and the highest heat of summer being from 24° to 60° C. (75° to 140° F.) with an average high range of summer heat for, at least, two consecutive months. It is in the large cities and more densely populated towns within this territory that the intestinal affections under consideration are so prevalent, especially among young children that they regularly add from 50 to 75 per cent to the gross mortality during the months of July, August and September of each year. It is

directly upon the southern border of this same belt or zone of the earth's surface, as it extends through the southern part of Europe and Asia that epidemic cholera most frequently makes its appearance, and from which it has apparently spread at different times over a large part of the civilized world. Without further general remarks I wish to limit your attention during the remainder of the present hour, to the causes and clinical history of serous diarrhœa and cholera morbus as they occur in both children and adults. In doing so I shall make use of the same facts and much of the same language, that I incorporated in a brief paper on the "efficient causes" of these affections, read to the Section on Diseases of Children, at the meeting of the American Medical Association in June, 1882.

Etiology and Prophylaxis.—When it is remembered that *one third* of the human race perish before they reach five years of age, and that a large percentage of these early deaths are the direct result of attacks of serous diarrhœa and cholera morbus in infancy, it will be conceded that no subject is more worthy of careful study than the etiology and prophylaxis of these affections. I mention etiology and prophylaxis together, because all measures designed to prevent diseases must be intelligently adjusted either to the removal of the efficient causes or to a neutralization of their effects, else they will fail to accomplish any useful purpose. Nearly all the public sanitary and hygienic measures which characterize the present stage of civilization, are aimed at the removal or prevention of the causes of disease, both predisposing and exciting. But there are many etiological influences of great potency in either predisposing to or exciting attacks of disease, which are not under human control. The problem presented for consideration concerning these, is not how to prevent or destroy them, but how best to shield the human system from their injurious effects. For instance, bad food may be destroyed and that which is good substituted in its place; bad and impure air in dwellings may be displaced by ventilation; soils wet and impregnated with decomposable vegetable and animal matter may be improved by drainage and cultivation; but the meteorological conditions of the atmosphere, whether they relate to impurities, sudden and extreme changes, or waves of continuous high or low temperature, are not subject to our control, and yet much can be done to mitigate or prevent their injurious effects. Nearly all the recent writers on practical medicine and on diseases of children class the cases of serous diarrhœa and cholera morbus in children under two years of age, usually called "summer complaint" and "cholera infantum," with the local inflammations under the general name of catarrhal gastro-enteritis. And while they all assert that these forms of disease are most prevalent and fatal during the warmest months of summer, they set forth as the chief causes improper feeding, impure and changed milk, impure and confined air, the progress of dentition or "teething," and overworked, badly fed, and unhealthy mothers and nurses. All these causes are represented as producing either gastric or intestinal indigestion or both, which so increases the irritation of the mucous membranes as to cause a more or less rapid serous exudation into the gastric and intestinal canal with excessive evacuations. It will be noted that *indigestion* is very generally alleged as the immediate cause of the so-called catarrhal irritation and excessive discharges; while the indigestion is in turn regarded as the result of bad feeding, impure air, teething, and unhealthy mothers or nurses. Dr. Flint and others have placed much emphasis on the influence of the adulterated and poor quality of milk distributed in our large cities. That the milk so distributed is often

of poor quality, and is productive of gastric and intestinal derangements, and that all the other causes enumerated are often the occasion of similar derangements, I freely admit. But I am quite certain that a more careful and extended clinical study will show that none of the causes usually enumerated really exert more than a minor influence over the production of the so-called summer complaint and cholera infantum that prove so destructive to infantile life in many of our cities and populous towns every summer. For instance, a moderate degree of attention will show that the errors in feeding infants, the adulterations of milk and impurities of other food, and the unsanitary condition of dwellings, are quite as prevalent in all communities during the winter as the summer. It is quite certain that in every community there are, on the average, as many children cutting their teeth in December and January as in July and August; and I have been wholly unable to find any larger proportion of unhealthy, badly fed, or overworked mothers or nurses at one part of the year than another. It is quite certain that if any one or all of these agencies exerted a prominent or controlling influence in determining attacks of serous diarrhœa and cholera infantum, such attacks would be met with frequently at all seasons of the year. Yet, both the records of the commencement of attacks and the statistics of mortality show that the prevalence of all grades of these two forms of disease is restricted almost entirely to the ninety days intervening between the last week in June and the last in September.

Thus, in Chicago, in 1877, only 2 deaths from cholera infantum are reported in the statistics of the Health Department during the months of November, December, January, February and March; 8 in April; 6 in May; 23 in June; 246 in July; 163 in August; 69 in September; and 13 in October. Again, in 1875 and 1876, I obtained the date of the commencement of 351 cases of serous diarrhœa and cholera infantum, of which 61 commenced in June, 197 in July, 66 in August, and 27 in September, and none during the remaining months of those years. The ratio of prevalence thus found to exist in the various months of 1875–6–7, in Chicago, will be found to fairly represent the ratio every year, and in all the Northern and Eastern cities of our country. If we turn our attention in another direction, we will be met by still greater difficulties in accounting for the prevalence of these bowel affections on the supposition that they are produced by the causes to which they have usually been attributed. For instance, the mortuary statistics show that the diseases under consideration prevail but little in cities so located that there is only a short range of temperature between the warmest days of summer and the coldest days of winter, and where, from sea breezes or otherwise, the summer nights are cool.

There is no evidence within our knowledge which shows that the milk distributed in San Francisco and New Orleans is any purer or of better quality than in Boston and Chicago. Neither are the nursing mothers any more free from mental and physical infirmities, nor the sanitary conditions of the dwellings, sewers, etc., more perfect in the two former than in the two last-named cities. Yet an examination of the mortality statistics of these several cities shows a ratio of only about five deaths from cholera infantum annually for every 10,000 inhabitants in San Francisco, and 7 in New Orleans, while Boston gives about 25 and Chicago 30 deaths from the same disease for every 10,000 of their inhabitants. The foregoing facts show conclusively that there must be some efficient cause or causes which determine the prevalence and fatality of the diseases under consideration that are not common to all large cities and all aggregations of civilized people.

Their prevalence at certain seasons of the year only, and chiefly in certain climatic regions, shows conclusively that they are dependent on causes which are operative under some circumstances not common to all civilized communities.

To determine what these circumstances are, I commenced, many years since, to keep a record of the date of beginning of all attacks of serous diarrhœa and cholera infantum coming under my observation, in connection with the coincident meteorological conditions of the atmosphere, and for three years coincident records of a similar character were kept by active practitioners in Cairo, Illinois; Davenport, Iowa; and Omaha, Nebraska. Reports giving the results of these investigations were made in the Medical Section of the American Medical Association, and published in the Transactions for 1875, 1877 and 1879, to which I must refer you for details. Those investigations were sufficient to establish the following important conclusions:

First.—That the prevalence of the affections under consideration is limited principally to the months of July, August and September, commencing with the first wave of high atmospheric heat that continues day and night for more than five days, which in the latitude and altitude of Chicago is sometimes the last week in June, but more frequently the first week in July, and continuing more or less during the succeeding ninety days.

Second.—That while the number of deaths from these affections in any city or given community will be nearly the same in the two first months after they begin—that is, July and August—the date of the initial symptoms, or beginning of the disease in three fourths of all the cases will be in July, very few originating after the first of August. Many cases that commence in July, and partially recover, are found to relapse or become worse during certain waves of high temperature in August; and a large percentage of those attacked in July continue wasting with the disease until relieved by death throughout the months of August and September.

Third.—That it is not simply high or extreme heat of temporary duration, such as that of a single day or of any number of days with cool nights, which favors the development of serous diarrhœa and cholera infantum, but continuous high temperature day and night through several days in succession.

And if, in addition to the high heat, the air be stagnant, as from lack of winds, or from obstructions, as in large and compactly built cities, or from defective ventilation of dwellings, the morbific effects are greatly increased. This explains why these affections are more numerous and fatal in cities than in rural districts, and why they prevail so little in large cities located in warm climates, provided the location be such as to afford cool breezes at night, as is the case in San Francisco and New Orleans, already alluded to.

Fourth.—That while the great majority of attacks which occur in any given summer are found to have their beginning in July, or during the first thirty or forty days after the first wave of protracted high temperature for the season, they are not equally distributed over the whole of the month, but are almost all traceable to a limited number of days and nights coincident with the waves or periods of continuous high temperature. From observations extending over twenty years in Chicago and three years in Cairo, Davenport, and Omaha, I have found that the special waves or periods of high temperature day and night vary in duration from three to fourteen days. When they do not extend beyond three

days, the effect on the number of attacks of serous diarrhœa and cholera infantum is slight. In Chicago, many summers have passed without a single period of continuous high heat of more than three or four days' duration, and such have uniformly been accompanied by a low ratio of infant mortality from bowel affections. In a majority of the seasons, however, there have been found three of those periods of continuous high temperature between the 25th of June and the 31st of July, each from five to seven days in duration. And the attacks of serous diarrhœa and cholera infantum have increased so rapidly that the number of deaths from these alone has caused the aggregate mortality of July to be more than double that of June. Much more rarely a season has occurred in which one of these periods of continuous heat day and night has commenced during the last week in June or first week in July, and continued with but little variation for two or three weeks. Such seasons have uniformly been characterized either by a prevalance of epidemic cholera or an extraordinary mortality from the serous fluxes in children.

Having thus traced the origin of that part of infantile mortality caused by the affections just named to the coincidence of continuous high atmospheric heat with a minimum of atmospheric currents, let us inquire, for a moment, how this combination of circumstances can affect the living human body.

First.—You have the physical law that the higher the temperature of the air the rarer it becomes, and the less oxygen is contained in each cubic inch. Consequently an individual breathing a given number of times per minute, and a given number of cubic inches of air at 27° C. (81° F.) would receive into the air cells of his lungs much less oxygen per hour than one breathing the same number of times and the same number of cubic inches of air at 18° C. (65° F.)

Again, a still or stagnant atmosphere, whether from the absence of winds or currents without, or of ventilation within, becomes more rapidly exhausted of its oxygen and impregnated with impurities from the breathing of living beings than one actively changed by currents and free ventilation.

Second.—The physical law of expansion by increase of temperature applies to living as well as to dead matter. Consequently continuous high heat, acting on the living human body, tends to increase the distance of the atoms or molecules from each other, and thereby lessen the force of vital affinity or general tonicity of the tissues, while it increases the excitability or susceptibility to impressions.

Third.—The capacity of the blood for taking up oxygen or holding it in suspension, depends much on the proportion of saline elements it contains, and under a continuous high temperature the increase of cutaneous exhalation rapidly diminishes the free salts of the blood, especially the chloride of sodium, and thereby directly lessens its capacity to receive the oxygen from the air-cells of the lungs in exchange for its carbonic acid gas. It is hardly necessary to add, that on the degree of oxygenation and decarbonization of the blood depends the sensibility and natural action of the vasomotor and all other portions of the nervous structure of the body. Here, then, you have in these waves or periods of high summer heat the coincidence of less oxygen to the cubic inch of inspired air; less capacity of the blood to take up and hold it in solution; less general tonicity of the textures of the body, with increased excitability of the mucous membranes and cutaneous surfaces from the direct stimulus of external heat. The two first of these conditions, by lessening the oxygenation and decarbonization of the blood, directly diminishes the influence of the

vasomotor nerves over the tone of the vessels of the morbidly excitable mucous surfaces of the alimentary canal, and thereby favors serous exudation instead of either natural secretion or absorption. Thus, by first establishing the coincident conditions under which serous diarrhœas and cholera infantum actually occur, and, second, by analyzing these conditions by the application of known laws of physics and physiology, you are enabled to see clearly the exact pathological conditions induced—namely, a morbidly sensitive condition of the mucous membrane of the alimentary canal, in conjunction with such a diminution of general tonicity and special impairment of vasomotor nerve influence as to impair the natural secretory actions, and directly establish more or less exudation of the serous elements of the blood. In a large proportion of these cases the resulting serous exudation is only sufficient to render the natural evacuations thinner and more abundant, constituting the mildest form of "summer complaint." From this you have all grades of severity up to an entire suspension of secretory action, and so rapid an exudation as to cause the copious vomiting and purging of an active cholera morbus; so copious indeed, sometimes, as to exhaust the water and salts of the blood, and induce fatal collapse in a few hours. The essential pathological conditions are, general impairment of tonicity of the tissues with deficient oxygenation of the blood, and special impairment of the vasomotor nervous influence over the vessels of the mucous membranes of the stomach and intestines. The exudation constituting the discharges results from these pathological conditions and has no necessary connection with any grade of inflammation, catarrhal or otherwise. Inflammation of portions of the mucous membrane often supervenes as a complication during the progress of protracted cases.

But ilio-colitis and recto-colitis or dysentery seldom occur until later in the season, when warm days are followed by cool nights, and frequent changes to wet and cold. And even the indigestion which has been so generally suggested as a *cause* of "summer complaint" is itself the *result* of the impairment of natural gastric and intestinal secretions and the increase of mere serous exudation; the primary fault not being so much in the quality and quantity of the food, as in the morbidly sensitive and relaxed condition of the whole inner surface of the digestive canal. The reasons why the children under two years are affected so much more severely than older persons, are, the less mature development and greater sensitiveness of their gastric and intestinal mucous membranes and glandular structures, and their much more constant confinement indoors.

If the foregoing views are correct, they indicate clearly that our efforts to lessen infant mortality from serous diarrhœa and cholera morbus must embrace such measures as will secure for young children a better supply of fresh, pure air for increasing the oxygenation and decarbonization of the blood and maintaining the activity of the vasomotor nervous system, and as will counteract the effects of high temperature by increasing the general tonicity and lessening the excitability of the tissues generally. Measures for the first object must consist in securing better ventilation of dwellings, and especially of nurseries and sleeping-rooms during the warmest part of the summer; the sending of young children, with their mothers and nurses, from cities and densely populated districts, to moderately elevated healthy locations, or to floating hospitals or receiving ships on large bodies of water during the special periods of continuous high temperature. For accomplishing the second purpose, I know of no measures that are so efficient, and, at the same time, within the reach of the poorest part of the population, as the judicious use of the sponge bath. Whenever the hu-

man system is relaxed, and rendered morbidly sensitive by continuous high heat, causing the infant to be languid, restless, and sometimes pale, a free bathing or sponging of the whole surface with water simply, as cool as is comfortable, always produces a refreshing and invigorating influence, which continues from six to twelve hours. Consequently, if mothers and nurses could be so instructed by their family physician that during every wave or period of high atmospheric temperature, in which the mercury did not fall below 21° C. (70° F.) during the nights, they regularly gave each child under two years of age a full sponge bath in the evening as well as in the morning, and kept their sleeping-rooms as well ventilated as possible, it would diminish the number of attacks of serous diarrhœa and cholera infantum one half, and consequently very greatly lessen the infant mortality from these affections.

It is well known to every careful observer, that a large majority of all the attacks of this form of disease show their first beginning during the last half of the night or early in the morning, owing to the long continuance of the high temperature, coupled with the more still and confined air of the night. The increased tone of the whole vascular system produced by the stimulant and tonic effect of a comfortably cool sponge bath on the function of the vasomotor nerves, applied in the evening, would enable thousands of these little, restless sufferers to pass the whole night unharmed, when without it the dreaded sickness would begin.

Symptoms or Clinical History.—Both for convenience and accuracy of description, I shall divide the intestinal summer complaints or fluxes of both children and adults into three groups. In the first group I shall embrace those cases in which the patient is suddenly attacked with copious vomiting and purging of serous fluid, which, after the first two or three evacuations becomes very thin, sometimes tinged yellow or green from the presence of the coloring matter of bile, and in other cases hardly staining the napkin.

Under the depleting influence of these evacuations the countenance becomes pale, the eyes sunken, the pulse small and frequent, the extremities cold and shrunken, the urine scanty or entirely suppressed, and the mind dull or inactive, with brief spells of great restlessness. In the more severe attacks these results follow so rapidly that fatal collapse is reached in from six to twenty-four hours.

In most cases, however, after the first eight or ten hours the discharges become less frequent and copious, the vomiting being limited to the rejection of drinks, whenever too much is allowed to accumulate in the stomach; and the passages from the bowels to from one to four or five in the twenty-four hours. As very little nourishment is either retained or assimilated, the patients continue to emaciate, and if not relieved by appropriate treatment, will usually reach the stage of fatal exhaustion in from one to three weeks. In the advanced stage of some of the cases there occurs a constant wakefulness or morbid vigilance, with rolling of the head, tossing of the hands, and frequent moaning.

Such symptoms are apt to induce the parents and nurses to think that the disease has "gone to the head." And I have known several cases presenting these symptoms, in which the attending physician had made cold applications to the head, blisters behind the ears; and in three cases, even leeches and a cathartic of calomel were resorted to under the impression that the symptoms indicated the supervention of inflammation in the brain or its membranes. It is hardly necessary for me to remind you that the symptoms mentioned were the result of cerebral anæmia or deficient supply of blood to the brain instead of inflammatory action.

Excessive losses of blood will often produce much discomfort in the head, accompanied by wakefulness, frequent turning of the head from side to side, and sometimes delirium. This anæmic condition of the brain, from whatever cause, may be distinguished from inflammation or active hyperæmia by noting the size of the pupils of the eyes, the tension of the carotid arteries, and in infants the condition of the anterior fontanelle. All grades of cerebral inflammation are accompanied at first by contraction of the pupils, fullness and hardness of the carotids, and convexity or bulging of the fontanelle; and it is not until the inflammation has terminated in effusion sufficient to cause compression that the pupils become dilated. But you must remember that the same amount of effusion which would produce compression and dilatation of the pupil, would also produce stupor or coma and still more fullness of the fontanelle; while in the anæmic condition of the brain, the dilated pupils and staring expression of the countenance are accompanied by sleeplessness instead of stupor by softness of the carotids, and by a sunken or concave fontanelle.

A large proportion of the cases I have included in this first group, after presenting the active symptoms of cholera morbus for the first few hours, instead of proceeding to a dangerous or fatal degree of exhaustion, undergo a different change. The vomiting ceases and the intestinal discharges become less frequent, smaller in quantity, contain some mucus and are sometimes streaked with blood. At the same time more or less febrile reaction comes on, causing the skin to become dry and warmer than natural, especially over the trunk of the body and in the palms of the hands; the pulse to be more full and frequent; and indications of abdominal pains just before and during the evacuations.

These are cases in which the rapid exudation from the ilio-colic membrane furnishing the material so actively vomited and purged during the first stage, so far detaches the epithelial layer as to favor true inflammatory congestion before the stage of extreme or fatal exhaustion, which converts them into cases of true ilio-colitis with secondary fever, as I pointed out to you when speaking of the various grades of inflammation in the alimentary canal.

In the second group of cases I include all those that commence with mere thin or serous evacuations from the bowels, with little or no pain or vomiting, and without pyrexia; and this embraces much the larger number of all the bowel affections that occur during the summer months. The intestinal evacuations in the cases belonging to this group vary much in frequency, color, and consistence.

In some cases they are from the beginning so thin and colorless as to look like turbid water in the vessel, and to leave hardly a stain on the napkin in young children. Yet the quantity voided is so large as to prostrate the patient very rapidly, causing the skin to become blanched and cool, the eyes sunken, the pulse small and weak, with all the indications of approaching collapse within a few days. In many of these cases the discharges after continuing long enough to induce a decided deficiency in the watery and saline constituents of the blood, and much general weakness, become smaller in quantity, less frequent, and mixed with some mucus. At the same time slight febrile symptoms supervene, causing increased heat in the abdomen, and if the patient be a child, it becomes more fretful and peevish. The intestinal discharges in different cases vary much in color, being in some cases green, in others pale yellow, and in still others a little turbid like rice water. They vary also much in consistency and odor, being in some cases thin as water and nearly odorless, and in others only semi-fluid, frothy, and extremely offensive. In

most cases some of the food or drink taken by the patient can be identified in the evacuations, together with numerous epithelial cells from the surface of the mucous membrane.

The urine is generally scanty in proportion to the copiousness of the intestinal evacuations. In many cases if the disease is not interfered with by treatment, the patients continue steadily to lose flesh until the emaciation is as complete as in the last stage of pulmonary tuberculosis, and death supervenes from simple asthenia or inanition, at periods varying from one to three months from the commencement of the attack. In nearly all the adults and in a large proportion of the children, however, after the disease has continued from one to four weeks, the discharges begin to improve both in number and quality, digestion and nutrition become more active, and in a few weeks the patients regain a fair degree of health. In a small proportion of cases, especially of young children, the recovery is only partial.

The stomach and duodenum apparently regain their natural condition; the child takes food well, and appears cheerful, but the intestinal discharges continue more frequent than natural, are semi-fluid or frothy, light yellow or grayish color, and usually very offensive.

They, also, often contain curds of milk or coagulated casein and particles of other undigested food. The urine, though generally less than natural, often contains an excess of the phosphates and lithates, which afford an abundant white or milky looking deposit when the urine stands until cold. With the foregoing symptoms the patient may continue several months, with a good appetite and an abundance of nourishment, and yet he loses flesh or becomes more emaciated every day. But the abdomen gradually increases in size, partly from flatulency and partly from hypertrophy of the mesenteric glands, until its prominence makes a strong contrast with the emaciated extremities. The cases that assumed this form were formerly called cases of tabes-mesenterica or marasmus, and sometimes continued one or two years before ending in death or recovery.

The third group of cases generally included under the head of "summer complaint" or intestinal flux, are distinguished from the two preceding groups by the presence of distinct febrile action at the beginning of the attack. With the first occurrence of vomiting or purging, or both, the skin is warmer and dryer than natural, the lips are parched, the pulse increased in frequency, and the patient more fretful with indications of more or less griping pains in the abdomen. If vomiting exists it is generally a retching or straining to vomit, with only a slight discharge of thin mucus, sometimes colorless but frequently tinged yellow or green from the coloring matter of bile. Of course much of whatever food or drink is taken is directly ejected by vomiting. The intestinal evacuations are generally small in quantity containing some mucus, frequent, and immediately preceded or accompanied by indications of griping pains in some parts of the abdomen. You will not fail to recognize these symptoms as indicating an inflammatory condition of the intestinal mucous membrane, identical with what I have already described under the class of local inflammations. When the disease is limited to the ilium and upper part of the colon, the discharges are usually thin or serous with some intermixture of mucus, and of a green or yellow color. When the lining of the lower part of the colon and rectum is the part chiefly affected, the evacuations are small, mucous, sometimes mixed with blood and accompanied by tenesmus or straining. But the symptoms, progress, prognosis and treatment of this class of cases I have already fully discussed

in the lectures on ilio-colitis, etc., and only give this brief description again because they are so frequently met with in the latter part of the summer and early part of autumn intermingled with the true serous intestinal fluxes and not always differentiated from them.

Anatomical Changes.—The visible structural changes found on the post-mortem examination of those who have died during the progress of gastro-intestinal fluxes will vary much in accordance with the duration of the disease before the fatal termination.

When death has taken place from collapse during the active stage of copious serous discharges, the mucous membrane is found extensively denuded of its epithelial layer, with here and there patches of redness which more resemble ecchymosis than inflammatory changes, and in some parts a degree of softening of the texture is easily recognized.

When death has resulted from asthenia after several weeks of exhausting discharges without febrile action, the mucous membrane of the intestines, like the other tissues of the body, is paler and more attenuated than natural with many superficial abrasions, more particularly throughout the ilium and colon. In the case of a child eighteen months old who died in the third month of a wasting serous diarrhœa which had commenced early in July, I found on making a careful post-mortem examination, in addition to the generally pale and shrunken condition of the tissues a remarkably attenuated and bloodless condition of the whole alimentary canal, including the mucous membrane, which was carefully examined throughout its whole extent. Only slight abrasions were found in portions of the membrane lining the ilium and colon. Many of the mesenteric glands were moderately enlarged.

When death has taken place at any time after the occurrence of the febrile reaction and the change in the discharges to a more mucous character, as I have already described, the post-mortem examination will reveal more distinct inflammatory changes in different parts of the intestinal mucous lining.

Prognosis.—In adults and in children over five years of age attacks of serous diarrhœa and cholera morbus rarely terminate fatally. Occasionally, however, cases occur in the vigorous period of adult life in which the copiousness of the discharges, both from the stomach and bowels, is such as to produce all the phenomena attributed to well marked cases of epidemic cholera, ending in profound collapse and death in less than forty-eight hours. But they are rare exceptions to the general rule of recovery. In infants or children under three years of age the results are widely different, the mortality being so great as to add more than fifty per cent. to the gross mortality of the months of July, August and September, in all the large cities and populous towns in the middle and northern part of the United States. But the prevalence of the disease is limited mostly to the months just named, and the mortality to children under three years of age.

LECTURE LXII.

Serous Diarrhœa and Cholera Morbus, continued—Their Pathology and Treatment.

GENTLEMEN: In the preceding lecture I directed your attention to the general history and etiology of the diarrhœal affections, more frequently called "Summer Complaints," which constitute so important a part of the sickness of every summer, especially in young children. From a careful review of the causes set forth as most efficient in determining the prevalence of this class of diseases and their *modus operandi*, as then explained, you have probably already inferred the most important items of their pathology. In that lecture I endeavored to show that all the causes and circumstances which favored the production of serous diarrhœa and cholera morbus, whether in children or adults, co-operated to produce an increase of the susceptibility or irritability of the mucous membrane of the alimentary canal, and at the same time to diminish the vital affinity, and consequently the tonicity of the whole vascular system.

This morbid excitability, coupled with impaired tonicity of the mucous membrane, constitutes the primary pathological condition in all the first and second groups of cases mentioned in the preceding lecture. The morbid excitability of the membrane invites a rapid influx of blood into it, while the diminished vital affinity and consequent relaxation of texture admit of equally rapid effusion or exudation of the serum or watery elements of the blood, thus furnishing the material for the copious and thin discharges. The rapid diminution of the watery element of the blood, carrying with it more or less of the saline constituents, in such discharges, speedily diminishes also all the glandular secretions such as urine, bile, gastric and salivary juices, etc., and retards the molecular changes in all the tissues which involves both diminution of temperature and notable shrinking of the whole body. The morbid sensibility of the nervous filaments involved in the mucous membrane, acted upon by the effused fluid, calls into action a reflex influence upon the muscular coat, thereby increasing the peristaltic motion and the frequency of the evacuations.

Such are the pathological conditions which constitute the active stage of the affections now under consideration. These morbid conditions can not exist long, however, without inducing other pathological changes of equal importance. For instance, the rapid exhaustion of the water and salts of the blood from a continuance of the discharges, soon renders that fluid too viscid to circulate freely through the capillary system or vessels, while the copious exudation carries with it a large amount of the epithelial cells of that membrane.

If the vomiting persists to such an extent as to prevent the retention of drinks long enough to afford any replenishment of the water in the blood, there will be danger of an entire suspension of the capillary circulation and a speedily fatal collapse. In a very large majority of the cases, however, the increased viscidity of the blood so alters its relations to the capillary vessels of the mucous membrane as to stop the effusive or serous exudation spontaneously, before the stage of collapse is reached. When the discharges thus cease before collapse ensued, rest and a careful replenishment of the blood by liquid nourishment soon establishes natural molecular and secretory actions, and health is restored in a large proportion of cases. But in a smaller number of cases, it happens that when the

discharges have ceased, and a healthy reaction has taken place in the tissues generally, there remain patches of the mucous membrane from which the epithelium has been detached so completely as to materially impede the capillary circulation in them.

In other words, to cause passive congestion first and subsequently a low grade of inflammatory action accompanied by moderate febrile reaction, which may continue from one to three or four weeks.

If the congested and inflamed patches are located chiefly in the membrane lining the ilium, the general symptoms will strongly resemble those of enteric or typhoid fever; if in the colon, both the intestinal discharges and the grade of fever will more closely resemble those of dysentery, as described when giving the clinical progress of the different groups of cases yesterday. But the mucous membrane is not the only structure in which the capillaries may fail to resume their functions when the active discharges have ceased, and the stage of reaction has come. When the attack of cholera morbus has been severe, and the amount of serous discharge by vomiting and diarrhœa so great as to produce a very marked deficiency of water in the blood, the latter may become so altered in relation to the capillaries of the brain, that the circulation becomes too feeble to sustain the function of the cerebral hemisphere. In such cases, though the intestinal discharges may cease, the circulation and warmth be restored in the extremities, and a general appearance of healthy reaction be established, yet the patients pass into a state of partial or complete coma from which they seldom recover.

Another, and perhaps more frequent local failure in the resumption of capillary and molecular actions, is in the kidneys. In the preceding lecture I stated that one of the early effects of copious serous or thin discharges from the lining of the alimentary canal, was a partial or complete suppression of urine. Clinical observations show that such suppression of urine continues after a fair re-establishment of natural action throughout the rest of the system, in some cases. The consequence is that symptoms of uræmic poisoning soon supervene. Such are the chief pathological conditions presented in the development and progress of the first and second groups of cases described in the preceding lecture.

The mildest class of cases of simple looseness of the bowels or slight "summer complaint" present only the two primary morbid conditions consisting of increased susceptibility and diminished tonicity sufficient to cause a moderate excess of serous exudation into the intestinal canal. But the protracted continuance of even this moderate drain may produce any or all of the subsequent pathological conditions I have described, as fully as the more severe and rapidly exhausting attacks of cholera morbus or cholera infantum.

Treatment.—What I have said in regard to the pathology of the important class of diseases under consideration, points directly to the following plain indications for fulfillment in their therapeutic management:

a. To allay the morbid sensitiveness or irritability of the mucous membrane of the alimentary canal.

b. To restore the general tonicity of the tissues and of the vaso-motor nervous system.

c. To properly regulate the diet, drinks and general hygienic surroundings of the patient.

To fulfill the first two indications named you need the combined influence of an anodyne and tonic; the first to allay the morbid sensitiveness, the second to increase the general tonicity of the tissues. In the early stage of mild cases, characterized by mere thinning of the intestinal

discharges and a feeling of lassitude with a little paleness, I have long been in the habit of using small doses of some preparation of opium in combination with a mineral acid, as in the following formula:

℞	Acidi Sulphurici Aromatici	10 c. c.	ʒiiss
	Tincturæ Opii	10 "	ʒiiss
	Syrupi Simplicis	15 "	ʒiv
	Aquæ	60 "	℥ii

Mix. Of this, four cubic centimeters (fl. ʒi) may be given to an adult in a little sweetened water, two, three or four times a day, according to the effect desired. To an infant from eight to sixteen months old the dose should not be more than from six to ten minims at the same intervals of time. Or the following, which is milder and perhaps preferable for young children:

℞	Acidi Hydrobromici	30 c. c.	℥i
	Elixer Simplicis	30 "	℥i
	Tincturæ Opii Camphoratæ	30 "	℥i

Mix. This may be given in the same doses both to adults and children as directed of the preceding formula, and diluted also with water when given.

If in addition to the moderate diarrhœa, the more important secretions are checked as shown by the absence of the coloring matter of bile from the intestinal discharges, and the scanty amount of urine, one of the following powders may be given each morning and evening in addition to one of the liquid prescriptions:

℞	Hydrargyri Chloridi Mitis	0.20 grams	gr. iii
	Sodii Bicarbonatis	0.40 "	gr. vi
	Sacchari Albi	2.00 "	gr. xxx

Mix. For an adult divide into four powders, and for a child twelve months old, divide into twelve or fifteen powders. The use of these should be discontinued as soon as the intestinal evacuations become yellow or green from the presence of bile.

In young children, when the disease has already continued in a mild form for one or two weeks, and the discharges give an offensive or sour smell and contain undigested casein or curds of milk, or items of other nourishment, the anodyne and acid formula may give place to the following:

℞	Acidi Carbolici	0.20 grams	gr. iii
	Glycerinæ	10.00 c. c.	ʒiiss
	Tincturæ Opii Camphoratæ	30.00 "	℥i
	Aquæ Cinnamomi	45.00 "	℥iss

Mix. To children from eight to sixteen months old, from ten to twelve minims may be given in half a teaspoonful of sweetened water every four, six or eight hours according to the frequency and quantity of the discharges.

In nearly all the mild cases the judicious use of some one of the foregoing formulæ, with a proper regulation of the nourishment and the daily

access to fresh, pure air, will be sufficient to speedily restore the patients to health. But when the attacks are more severe, constituting what I described in the preceding lecture as cholera morbus or cholera infantum, and the matter vomited yields a sour odor, I order a solution of bicarbonate of sodium four grams (℥i), and sulphate of morphia six centigrams (gr. i) in sixty cubic centimeters (℥ii) of water; of which I give from six to fifteen minims, according to the age of the child, immediately after each paroxysm of vomiting. At the same time, if the discharges from the bowels are frequent and very thin like water, I give one of the following powders every three or four hours until they are diminished:

℞			
	Hydragyri Chloridi Mitis	0.20 grams	gr. iii
	Plumbi Acetatis	0.20 "	gr. iii
	Pulveris Opii	0.06 "	gr. i
	Sacchari Albi	2.00 "	gr. xxx

Mix. For a child aged six months, divide into twelve powders; twelve months eight powders; eighteen months six powders.

The rule to give whatever medicine is designed for the direct suppression of vomiting in small doses *immediately* after each paroxysm of vomiting is one of much practical importance. Vomiting is an act that can not be performed continuously, but must always occur in paroxysm, with an interval of greater or less length between them. Therefore, if you give a dose of medicine immediately after a paroxysm of vomiting, it will remain in contact with the lining membrane of the stomach a few minutes, at least, before another effort to vomit can be made. During these few minutes, if the medicine is soluble, or already in solution, it will make some impression both on the nervous filaments and on the capillaries of the mucous membrane; and a prompt repetition of the dose after each paroxysm of vomiting will soon accumulate an effect sufficient to destroy the morbid sensibility and thereby stop the vomiting. But if you follow the wishes of the patient and the inclination of almost all nurses, by waiting for the former to "rest a little," or for the stomach to get "settled," that little period of rest will be sufficient for the muscular coat of the stomach to have regained its contractility, and the mucous membrane to have poured out a new supply of serous fluid, and consequently the patient is ready for another paroxysm of vomiting. Now if you administer the dose of medicine it is almost certain to be rejected as soon as it is swallowed and you gain no influence over the morbid conditions. The same rule is important in reference to the use of enemas for aiding in the suppression of diarrhœa or dysentery. They should be administered as soon after an evacuation as possible, for the longer they are delayed the more will the mucus or serum and other contents of the bowels have accumulated in the rectum and the more readily will the introduction of an enema be followed immediately by its expulsion. These details are given you, because success in the treatment of the more active gastric and intestinal affections of a choleraic nature, depends quite as much on the time and manner of administering the medicine, as upon the kind of medicine used.

Some cases, both of serous diarrhœa and cholera morbus are met with every summer, in which the discharges, instead of being sour and destitute of the coloring matter of bile, are bitter and highly colored with the latter fluid, thereby showing a superabundance instead of deficiency of the biliary secretion. In such cases, instead of giving alkalies or alkaline salts and mercurials, all of which increase more or less the glandular secretions, I resort directly to small and frequently repeated doses of anodynes and

astringents, of which the combination of acetate of morphia and acetate of lead are the most efficient, or more frequently to the following anodyne and antiseptic formula:

℞	Acidi Carbolici	0.20 grams	gr. iii
	Glycerinæ	15.00 c. c.	℥iv
	Tincturæ Opii Camphoratæ	30.00 c. c.	℥i
	Aquæ Cinnamomi	45.00 c. c.	℥iss

Mix. Give to children between six and eighteen months old from ten to twenty minims every one or two hours in active serous diarrhœa, and after every paroxysm of vomiting in the active stage of cholera infantum.

You must keep constantly in mind the important clinical fact, that in all cases of copious intestinal evacuations, the urine is liable to become scanty, and that the suppression of such evacuations by opium and astringents often leaves the secretory action of the kidneys very defective and sometimes entirely suppressed. This result can be very generally avoided by giving the following prescription in doses suited to the age of the patient:

℞	Spiritus Etheris Nitrosi	15.00 c. c.	℥iv
	Tincturæ Digitalis	4.00 c. c.	℥i
	Syrupi Simplicis	15.00 c. c.	℥iv
	Aquæ	60.00 c. c.	℥ij
	Potassii Acetatis	12.00 grams	℥iii

Mix. To an adult four cubic centimeters (fl. ℥i), and to a child twelve months old ten or fifteen minims may be given every two, three or four hours, according to the effect desired.

In some of the more active cases of summer diarrhœa and cholera morbus, after the first stage has passed, the vomiting ceased, and the intestinal discharges reduced to one in from two to four hours, a low grade of febrile action is set up causing dryness of the mouth, much thirst, restlessness, considerable griping pains before each evacuation, and more or less mucus mixed with the thin fæces; thus bringing them fairly within what I described yesterday as the third or more inflammatory group of intestinal affections. In nearly all of such cases the following emulsion will be found one of the most efficient that can be used:

℞	Olii Terebinthinæ	8.00 c. c.	℥ij
	Olii Gaultheriæ	2.00 c. c.	℥ss
	Tincturæ Opii	8.00 c. c.	℥ij
	Mucilaginis Acaciæ	15.00 grams	℥iv
	Sacchari Albi	15.00 grams	℥iv
Rub together thoroughly and add:			
	Aquæ	90.00 c. c.	℥iii

Mix. Direct the nurse to shake the vial, and give to children between eight and eighteen months old from eight to twelve minims, every three, four or six hours, according to the frequency of the discharges, until the latter become consistent and natural.

When cases of serous diarrhœa or summer complaint have become chronic and accompanied by much emaciation, with coolness of the surface and extremities, the intestinal discharges continuing thin and too

frequent, but without dysenteric straining or any notable intermixture of mucus, the remedies should contain some element of a more tonic character.

In such cases I have often directed the following formula, with much benefit to the infantile class of patients:

℞	Phloridzinæ	2.00 grams	gr. xxx
	Spiritus Ammonii Aromatici	4.00 c. c.	ʒi
	Tincturæ Opii Camphoratæ	30.00 c. c.	ʒi
	Syrupi Simplicis	15.00 c. c.	ʒss
	Aquæ	45.00 c. c.	ʒiss

Mix. To children under two years of age give from ten to twenty minims three or four times a day. The phloridzine is derived from the bark of apple-tree root, and is a mild tonic not unpleasant to the taste and agreeable to the stomach, while the camphorated tincture of opium supplies the necessary anodyne influence. Another formula which I have occasionally used in the same class of cases is as follows:

℞	Erigerontis Canadensis	15.000 grams	ʒiv
	Quiniæ Tannatis	1.300 grams	gr. xx
	Morphiæ Sulphatis	0.066 grams	gr. i

Mix. Pour on the whole, half a liter or one pint of boiling water to make an infusion. When it is cold you can give to a child one year old four cubic centimeters or one teaspoonful, to which a little sugar may be added, every three, four or six hours. This combination has the advantage of being moderately diuretic and tonic while it is efficiently anodyne and astringent. In some very protracted cases, accompanied by an anæmic condition of the blood, I have seen very good results obtained by giving suitable doses of the liquor ferri nitratis, morning, noon and tea-time, and one of the following powders at bed-time:

℞	Quiniæ Tannatis	0.200 grams	gr. iii
	Pulveris Opii	0.065 grams	gr. i
	Hydrargyri cum Cretæ	0.200 grams	gr. iii
	Sacchari Albi	1.500 grams	gr. xx

Mix. Make into six powders.

In the treatment of this important class of bowel affections I have thus given you an unusual number of prescriptions or combinations, not for the purpose of encouraging either polyphamary or over medication, but rather for the purpose of enabling you to select from the variety some one calculated to meet the indications in each individual case; and at the same time to illustrate the value of combining agents to meet more perfectly the coincident indications presented in different stages of the progress of the same case. The maxim that a thorough knowledge of the nature and capabilities of a few remedies is better for the practitioner than an imperfect knowledge of many, is doubtless true. But it is equally true that a thorough knowledge of many remedies, even of the same class, is much better than such knowledge of only a few. For nothing is more certain than that every active practitioner who relies on treating almost all cases of disease with some one of half a dozen remedies with which he has become clinically familiar will every now and then find himself cornered at the bed-side, or at the end of his therapeutic resources, by some

unusual feature of the disease or idiosyncracy of the patient. And this will happen in the management of no class of diseases more frequently than in those classed as bowel affections of children.

Thus far I have said little or nothing in regard to the nourishment for this class of patients, and yet it is a matter of the highest importance. In all cases occurring in infancy, if the child can have good breast milk, either from the mother or a healthy wet nurse, it is preferable to any or all other articles that have been devised.

But if artificial food must be provided for these little sufferers, I am satisfied from many years of observation that there is nothing better than good, fresh cow's milk, to which may be added lime water, in the proportion of four parts of the milk to one of the lime water. If this combination is sweetened a little, either with white sugar or sugar of milk, it will possess as near the properties of the mother's milk as anything that can be used. One of the most common errors in the feeding of very young children consists in diluting the milk, or whatever else may be used, too much. Nothing is more common than to give infants, under six or eight months old, simple bread or cracker water, or a mixture of one part of cow's milk with two or three parts of water, slightly sweetened with sugar. Of course the more nourishment is diluted with water the larger must be the quantity taken to afford a given amount of material capable of being converted into elements for the growth and repair of the tissues of the body. And I have seen many an infant worrying day and night from the combined sensations of hunger and colic, while its stomach and bowels were filled to repletion with *bread-tea*, toast water or a mixture of one part of milk with three of water. The correct rule for our guidance in selecting food for young children, especially when they are suffering from morbid sensitiveness of the mucous membrane of the alimentary canal, is to get as much of the elements capable of being converted into nutritious material as possible into a small compass or bulk, and yet have it bland and easy of absorption by the vessels of the stomach. There is no substance that fulfills these requirements better than a thin, well boiled gruel of pure sweet milk and wheat flour.

One teaspoonful of such gruel contains more material capable of being converted into flesh and blood than two tablespoonsful of a mixture of one part milk and three parts of water and is far more likely to be retained and absorbed by the stomach.

Another object of great importance in the management of the class of diseases now under consideration, especially as they affect young children, is to obtain for them access to fresh and pure air. Their confinement in small, overheated and badly ventilated rooms is one of the most efficient causes of their sickness and mortality.

Consequently, so far as possible, all chronic cases should be removed to hilly and healthy districts of country, or to boats or ships floating on large bodies of water. When neither of these is practicable a short ride in an open carriage or buggy, every day, and the maintenance of thorough ventilation and cleanliness in the rooms they occupy, will constitute the best substitute.

LECTURE LXIII.

Epidemic Cholera—Its History, Causes, Symptoms, Pathological Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The subject which will occupy our attention the present hour is one of much interest, and on which volumes have been written, both in this country and Europe. I allude to epidemic cholera, which has also received the names of cholera asphyxia, cholera algida, spasmodic, malignant, Asiatic, and Indian cholera.

I prefer to call the disease epidemic cholera, simply because it serves to distinguish it from common sporadic or endemic cholera morbus, without implying any theory of either its nature or origin.

History.—Some descriptions in the writings of Areteus have been supposed to apply to this disease, and Professor Martin Hoag has claimed to have found some distinct references to it in the ancient Sanscrit writings; but the earliest reliable accounts we have of its prevalence are by D'Orta, in 1563, at Goa, and during the seventeenth century by Bontius of Batavia, and Willis, Morton and others in England. In 1733, Morgagni in Italy, and in 1736, Degner in the Netherlands, described the prevalence of epidemics having much resemblance, at least, to the genuine epidemic cholera. In 1781–2, the disease prevailed and proved very fatal in Calcutta, Madras, and Ceylon. The first great migratory epidemic of which we have any account, commenced at Jassore, in August, 1817, and soon after at Calcutta. During the next five years its ravages were extended to almost every populous town in China, the south of Asia, the East India Islands, and as far westward as the eastern border of the Mediterranean sea. In 1831 it made its appearance in Europe, and prevailed destructively in many of the more populous districts and cities, from Archangel, in 64° north latitude, to the borders of the Mediterranean south, before the end of the year. The following year it became almost equally prevalent for the first time on this continent.

It was first recognized in Quebec on the 8th of June, 1832. A few days later it was also prevailing in Montreal, New York and Albany, and before the end of the summer months it had manifested its destructive presence in the principal cities of twelve States, extending from Boston to New Orleans. During the two following years it visited prominent places in Mexico, the West India Islands, and from 1834 to 1837, it again severely scourged nearly all the countries in the South of Europe and in Central America. During the next decade nothing was seen or heard of its prevalence in any part of Europe or America. In 1847, however, it severely attacked a Russian army west of the Caucasus, and during the year 1848 it revisited almost every country in Europe. Late in the autumn of that year the disease developed on board of two emigrant ships in mid-ocean, the one sixteen and the other twenty-seven days out from Havre. They were nearly one thousand miles apart at the time the disease appeared on board, the one being bound for the port of New York, the other that of New Orleans. In the latter city the disease developed into a very severe and fatal epidemic almost immediately after the arrival of the vessel in the month of December. But it showed no signs of prevalence in the city of New York until the latter part of April, 1849, and did not reach decided epidemic prevalence until the latter part of June, July and

August. During these months, however, it prevailed more or less in nearly all the more populous cities and in many of the country districts throughout the United States and Canada. From 1849 to 1854, the disease reappeared each summer in many of our cities, more especially those on the great interior lakes and in the lower part of the valley of the Mississippi; but in the summer of the last named year it became more generally prevalent and was more fatal.

During the years 1854 and 1855, it revisited many parts of Europe, after which it disappeared from the countries on both sides of the Atlantic until 1865, when it again became prevalent, first in Egypt and Arabia, and later in several places in Europe. During the following year, 1866, the disease visited the more prominent places in the southern and central parts of Europe and reappeared also in many cities in this country. In 1867–8, its chief prevalence was in Central and South America, and in some of the West India Islands. During the summers of 1871–2, it was again quite prevalent in Europe; and in the summer of 1873 it manifested a remarkable prevalence in some of the cities and purely agricultural districts in the States of Tennessee, Kentucky, Ohio, Indiana, and Illinois. During this and the following year the disease was also prevalent in some parts of South America, more especially in Buenos Ayres, where it proved very fatal. Since that date, 1874, the disease has prevailed in variable degrees of severity in some parts of India, or the south of Asia, almost every year; and during the past summer, 1883, it has manifested an extraordinary prevalence in Egypt, but has not noticeably prevailed in any part of Europe or America. From this very brief historical sketch, you will see that thus far during the century, there have been three extraordinary periods of epidemic prevalence of the cholera in Europe and America. The first commenced in 1831 and continued until 1837; the second extended from 1847 to 1855; and the third from 1855 to 1874. A less noticeable period of epidemic prevalence commenced in 1817 and continued until 1822, but was confined mostly to Asia and the countries and islands east of the Mediterranean. Confining our attention to this country and Europe, it would appear that during this century, the epidemic periods of cholera prevalence have varied from five to nine years, while the interval or period of exemption has not varied much from ten years. If this general rule is to continue, we may expect the commencement of another epidemic period for Europe and America next summer, or at the longest, the summer following. Both in regard to the number of persons attacked and the ratio of mortality during the prevalence of an epidemic, the cholera must rank among the most severe scourges of the human race. Like all the more important acute non-contagious diseases capable of periods of wide-spread epidemic prevalence, the epidemic cholera appears to have a permanent *habitat*, or natural home, where it is more or less prevalent every year. This home is in India, where it is as much an endemic as the yellow fever is in the West Indies.

Causes of Epidemic Cholera.—All the causes or influences that I enumerated in the two preceding lectures, as favoring the production of attacks of serous diarrhœa and cholera morbus, also act as predisposing influences favoring the prevalence of epidemic cholera. The chief of these influences are continuous high temperature, still, or stagnant and damp air, with such atmospheric impurities as arise from badly ventilated rooms, and from the presence of the products of decomposing organic matter either in the soil or water, or both.

That local conditions pertaining to organic impurities in the soil, water and atmosphere, have an important causative influence in the production

and spread of epidemic cholera, is clearly apparent from the facts accompanying every epidemic. A detail of these facts would occupy too much of your time in the lecture room, consequently I will refer only to some of the more prominent, which may guide you in studying them further at your convenience. First, the disease has never, in this country at least, been known to prevail as an epidemic in elevated country districts, presenting primitive geological strata, with uneven surfaces, rapid streams, and pure water. For instance, during the epidemic of 1849, in New York City, hundreds and thousands fled from direct contact with the disease in the city to the highlands up the Hudson river, and to the mountains of Vermont and New Hampshire, and though some sickened and died on the way, in none of these regions did the disease manifest any disposition to prevail. But along water courses skirted by alluvial deposits, and over comparatively level and especially malarious districts, the disease has spread, and often proved as fatal in proportion to the number of inhabitants as in the most populous cities. See History of its Prevalence in the Mississippi Valley in 1873. Second, in all the cities and districts where it prevails, the attacks are much more numerous and severe in the low, damp, and uncleanly streets and neighborhoods, than in those presenting the opposite sanitary conditions.*

Third, in every epidemic of cholera, the ratio of attacks and of mortality has been much greater in that part of the population characterized by uncleanly and intemperate habits, and those of foreign birth, than in any other classes. This was strikingly illustrated in the prevalence of cholera in this city (Chicago) in the summer of 1873. In that season, although a few well marked cases occurred in other parts of the city, its prevalence was limited almost entirely to a single neighborhood on the southern border of the city, occupied by an unsanitary foreign population, whose water supply was from shallow wells, containing only water that had filtered from the surface soil.

Another important predisposing influence is high temperature. With the exception of the epidemic in New Orleans, which commenced in December, 1848, and prevailed very severely through that and the next succeeding month, all the cholera epidemics in this country of which I have any knowledge, have occurred not only in the warm season of the year, but in seasons the average temperature of which was above the mean for a series of years. But the occurrence of the disease in New Orleans in December, 1848, constituted no exception to its prevalence during high temperature, for the records show that at the time, the temperature ranged from 24° to 29° C. (75° to 85° F.) coincident with a still, damp, and very impure atmosphere.

As further illustrating the effects of temperature, I may remind you that the cholera was brought on board of an emigrant ship, into the harbor of New York, during the same month of December in which it developed so rapidly in New Orleans. And although the ship and its living cargo were detained in the quarantine, yet many of the passengers escaped to the city, and a few of the number were found sick with the disease in the city. But in New York, at that time, the temperature was as low as the average for winter in that latitude, and became still colder during the succeeding month. Consequently the disease wholly failed to develop in the city, and in a few weeks disappeared from the quarantine

* For details concerning the epidemics from 1848-9 to 1854, see reports in the Transactions of the American Medical Association. Volumes II, III, IV, V, VI. Also a volume on Epidemic Cholera, by D. Meredith Reese, M. D., of New York. For the influence of local causes on the epidemic of 1866 in Chicago, see Chicago Medical Examiner, Volume VIII, p. 637 to 658.

Again, the development and severe prevalence of the disease in Egypt during the past summer (1883), occurred directly under the coincident influence of high temperature, with extreme contamination of both air and water from decomposing animal matter, constituting a combination of local circumstances closely analogous to those accompanying the gathering of pilgrims at Mecca and other places in India. These considerations lead directly to the important etiological question, whether any combination of the predisposing influences I have named, is capable of giving rise to the disease, or must there be present in addition a specific cholera poison, or organic germ, derived from some other source, while the predisposing influences only serve to increase its development or propagation and intensify its activity? The latter has been the popular doctrine in the profession for the last twenty years. A large proportion of the more recent writers not only claim that the disease arises from a specific poison or infection, but also that such infection consists of organic germs or microphytes, developed in the blood and intestinal discharges of those suffering from the active symptoms of the disease.

Those who advocate this view of the efficient cause of cholera pretty generally regard the same as originating in the valley of the Ganges, and as extending to other countries only by the transportation of the infectious microphyte from its native place in Asia. It was this idea that caused the disease to be so generally called Asiatic cholera. Of those who regard the disease as originating solely in Asia, one part regard the cause as a true *contagium vivum* capable of propagating the disease from person to person, like that of variola, while a much greater number regard the active cause as an infectious microphyte generated outside of the human system, but capable of propagation in the alimentary canal and the serous discharges therefrom. And by many it is supposed that the spread of the disease from place to place, or from one country to another, is effected chiefly through the agency of the cholera dejections in communicating the infectious principle or agent to the soil, water and atmosphere wherever such dejections are carried. Many microscopic investigations have resulted in discovering bacteria or microphytes in the evacuations during the progress of cases of epidemic cholera, more especially when the examinations are made after the discharges have been kept in a warm atmosphere from eighteen to twenty-four hours.

But hardly any two of the investigators agree as to the special microphytes peculiar to the cholera cases, and none of them have satisfactorily demonstrated their causative influence. During the prevalence of the disease in this city in 1866 and again in 1873, I subjected many specimens of cholera discharges to careful microscopic examinations both immediately after they were voided and at short intervals for three succeeding days. In the examination of specimens just voided, very few microphytic formations of any variety could be detected, but after twelve or eighteen hours they became more numerous, and they continued to multiply during the three days they were kept for observation. On extending my examinations, however, to the thin or serous discharges of simple cholera morbus and those of the "summer complaint" or common diarrhœa of young children, I obtained results so nearly identical that I could not maintain any line of distinction between them. I did not abandon the search until I became satisfied that there were no organic germs or bacterial forms in the discharges during epidemic cholera, that were not also found in the dejections of cholera morbus, summer diarrhœa, and all other thin discharges from the mucous membranes, provided the specimens were all treated alike. Whether the several commissions that were organized

under the directions of Koch, Pasteur and others, and sent out during the past summer to investigate the severe epidemic of cholera in Egypt, have made any new or important discoveries can not be known until their reports are received and critically examined. It must be acknowledged, therefore, that up to the present time the efficient or specific cause of epidemic cholera, if such cause exists, is unknown. That the prevalence of the disease in any given locality is mainly dependent upon the local conditions of temperature and organic impurities present in the soil, water, and atmosphere, coupled with the personal hygiene of the inhabitants, is proved by the whole past history of the disease. My own clinical observations in seven seasons of cholera prevalence, have afforded the strongest evidence that the disease is not propagated by personal contagion, that is, not directly communicable from person to person. Whether the general and local conditions to which I have alluded as favoring the development and spread of cholera, when strongly concentrated, are capable of directly producing the disease, or whether this indirectly develops a specific infectious miasm or microphyte that like other infections is capable of being carried in clothing, or confined air, from one locality or country to another, and of being propagated whenever it meets favorable local conditions, are questions by no means satisfactorily settled. By a large majority of writers of the present day the last question is answered in the affirmative.

And some, like Dr. J. C. Peters of New York, have given us elaborate and ingenious maps, designed to show the origin of each epidemic, in its supposed Asiatic home, and its spread by transported infection from place to place on both continents. But there are so many gaps in the lines, filled by *suppositions* or the imagination of the writers, as to render them of little scientific value.

Another circumstance strongly supporting the idea that the essential cause or causes of the disease originate in the locality where the disease prevails, instead of having been imported from some other place, consists in the fact that in almost every epidemic season, isolated cases of a well marked character occur in different streets or neighborhoods, and gradually increase in number for some time before the arrival of the supposed infection from any other source. Thus Dr. Fenner and others in active practice at the time, record the fact that cholera diarrhœa and some cases presenting all the characteristics of cholera occurred in New Orleans, in December, 1848, before the ship which is credited with having brought the infection had reached within five hundred miles of that port. And the same has been true in reference to the first cases occurring at the beginning of every cholera epidemic in Chicago since 1850.

Symptoms and Clinical History.—In a very large proportion of the cases of cholera, the more active symptoms are preceded by a moderate serous diarrhœa from one to five or six days. The discharges during this stage usually average three or four in the twenty-four hours; are very thin and voided without pain or effort, but are accompanied by a cool and pale condition of the cutaneous surface and a general feeling of weakness. After the continuance of this apparently mild diarrhœa one or more days, the more active symptoms are somewhat suddenly ushered in by an unusual feeling of weakness coupled with an active rumbling or peristaltic motion of the bowels quickly followed by a very copious watery evacuation; and frequently before this is finished an active paroxysm of vomiting supervenes. This finished, the patient lies down under a feeling of languor and exhaustion, with general paleness of the surface, a soft, weak and slightly accelerated pulse, respiration nearly natural, temperature

natural or slightly below, urinary secretion diminished, and mouth deficient in moisture with some thirst. In the great majority of cases this sudden development of the active stage takes place during the last half of the night or before ten o'clock in the morning.

In cases of average severity, the paroxysms of active vomiting and purging continue to recur at intervals varying from ten to thirty minutes, the discharges from the bowels being copious in quantity and having the appearance of turbid water, or that in which rice has been macerated. After the first two or three passages there is seldom any appearance of the coloring matter of bile in the evacuations either from the stomach or bowels, and the urinary secretion is much diminished, and in some cases, suppressed.

Soon after the commencement of active vomiting and purging, severe cramps are felt, usually in the muscles of the calf of the leg first, and as the continuance of copious evacuations rapidly diminishes the relative proportion of the aqueous and saline elements of the blood, the cramps extend to the thighs, arms and muscles of the chest and abdomen, adding very much to the suffering of the patient. In the mean time the countenance and whole surface has shrunken, the eyes sunken in the sockets, the lips pale and thin, the extremities cold and bluish from the lessening of the circulation in the capillaries, the pulse frequent and weak, the mouth dry with intense craving for cold water, and the voice husky and feeble. After the first hour the skin becomes bathed in perspiration, which, added to the copious gastric and intestinal discharges, still more rapidly exhausts the blood of its water, until at the end of from three to six hours it becomes too thick to circulate through the smaller vessels, the pulse disappears from the wrist, the intestinal discharges become involuntary, all natural glandular secretions are suppressed, and the patient enters the stage of complete collapse. In this stage he may linger from one to five or six hours, presenting a cold, wet and shrunken state of the surface and extremities. The mind is dull, the eyeballs turned upward and eyelids only partially closed and the voice suppressed. He no longer vomits, but still has an occasional small involuntary discharge from the bowels with an occasional muscular cramp, and at length the chin drops, the breathing becomes irregular, the heart beats unsteady, and finally all the phenomena of life cease. Such are the prominent symptoms, and such the usual progress of attacks of epidemic cholera, when sufficiently severe to reach a direct fatal termination.

The time occupied by the stage of active vomiting, purging, and cramps varies from three to twelve hours; that of collapse from one to six hours, in most of the fatal cases. In the midst of severe epidemics, however, you will meet with a few cases in which the violence of the cramps and copiousness of the evacuations bring on collapse and death in five or six hours. In the epidemic of 1854, in this city, I saw a case in the person of a Scandinavian laborer who went to his usual work in a lumber yard after breakfast apparently well. After continuing his work about an hour he became so weak that he was carried home on a dray, went to the water-closet and had one very large watery evacuation from the bowels and one turn of vomiting; returned to his room, sat long enough to smoke his pipe, took to his bed, became rapidly cold, bluish, shrunken, and with only slight cramps in his legs, passed into complete collapse and died in less than six hours from the time of first complaining. On the other hand a large proportion of the cases of cholera in every epidemic run a milder course than I have described and tend toward recovery.

After from one to three or four days of premonitory diarrhœa, the active

stage is ushered in by vomiting and purging of a serous or rice water fluid, soon followed by muscular cramps, small weak pulse, cool and shrunken condition of the extremities, extreme thirst and dryness of the mouth, with weak or husky voice, and little or no sweating. When these active symptoms have continued from three to six hours, greatly diminishing the relative proportion of the water in the blood and bringing the patient to the verge of collapse, they begin to abate. The intervals between the passages from the bowels and also between the acts of vomiting, become longer, the quantity passed at each time less, and in two or three hours more the vomiting and cramps cease, the pulse becomes slower and fuller, warmth returns to the extremities, the craving for drink diminishes, and the patient is inclined to sleep. In many cases after a few hours rest it is found that the renal secretion is more free, the mouth moist, and when the bowels move the passage is only semi-fluid and tinged with the coloring matter of bile; in a word, that the secretory functions generally have been restored and the patient fairly entered upon the stage of convalescence. Under rest and a mild diet, such cases rapidly recover their usual health and strength. You will meet, however, at the bedside, a considerable number of cases one grade more severe than those just described. The stage of active vomiting, purging, cramps, etc., though protracted and severe, will nevertheless cease before inducing complete collapse; but instead of passing directly into convalescence, the mind becomes dull or drowsy, the face suffused with redness, the lips and mouth remain dry, the urine scanty, and the extremities warm with more or less congestion of the skin, constituting a moderate general febrile reaction. This moderate grade of fever, accompanied by sufficient irritability of the stomach and bowels to cause an occasional vomiting, and three or four thin, gray or reddish brown passages in the twenty-four hours, may continue from five to nine days, during which the assemblage of symptoms closely simulate those of enteric typhoid fever. In the majority of cases this secondary fever terminates in the gradual establishment of convalescence, but in some a low grade of inflammatory action is established in the mucous membranes, which causes the evacuations to continue with inability to retain and assimilate nourishment, and a fatal degree of exhaustion supervenes.

You have thus three grades of active cholera attacks; the first, which runs its course in from six to eighteen hours, and ends in actual convalescence; the second, in which the active stage is more severe, but stops short of inducing full collapse, and is followed by one or two weeks of secondary fever; and third, those cases in which the active stage is so severe and the discharges so copious as to cause direct and generally fatal collapse.

Anatomical Changes.—During the epidemic outbreaks of cholera in this country in 1849 and the five or six succeeding years, many very thorough post-mortem examinations were made, and the changes in the solids and fluids of the body were studied with much care. During the epidemic of 1849 in Boston, thirty-three autopsies were made, twelve on males and twenty-one on females. The ages of those examined varied from ten to sixty years, though a large majority were of adult age. The brain and its membranes were pretty uniformly reported natural. In a few cases slight serous effusions existed in the ventricles and on the surface of the membranes, and in fifteen of the cases the arachnoid surface covering the posterior part of hemispheres was covered with a thin layer of "dark, thick, bloody fluid," which was supposed to have transuded after death. The only unnatural appearances in the chest were an unusually dry and

shrunken condition of the pleura and pericardium. The lungs showed only slight indications of congestion in a few of the cases. The right cavities of the heart were not distended with blood, but in fourteen of the cases spots of ecchymosis were found beneath the endocardium and sometimes in the pericardium. In the abdominal cavity, the peritoneum was found covered with a thin layer of opaline secretion or exudation, giving it a moist and sticky feel. The liver and spleen were contracted and contained less blood in their vessels than natural. The kidneys appeared nearly natural, in a few of the cases a little flaccid, but the mucous membrane lining the bladder and vagina was, in nearly all the cases, covered with a thick layer of fluid of a creamy consistence, while the bladder itself was contracted and empty of the urine. The contents of the alimentary canal varied much in consistence and color in different cases, but in most of them they were thin, yellowish-white or like soapy water, and contained both albumen and the coloring matter of bile. The microscope revealed an abundance of columnar epithelium and detached cells. The mucous membrane lining the stomach and intestines was generally pale, or natural in color, with no appearance of inflammatory congestion or general redness of the surface. The blood in the cavities of the heart and large vessels coagulated less readily and firmly than natural, and in fifteen of the cases the serum was distinctly thicker or more viscid than that of healthy blood. The rigor mortis and post-mortem contractions existed in all the cases.*

During the same year, while the cholera was prevailing in Philadelphia, a committee appointed by the College of Physicians made still further investigations concerning the condition of the intestines in this disease. Dr. John Neill first filled the vessels with a fine injection colored with vermillion, and then subjected the mucous membrane to careful microscopic examination. The epithelial layer of the mucous membrane was found in all the specimens examined, "either entirely removed, or adhering loosely, as a pulpy layer mixed with mucus or an albuminal substance." The villi were also denuded of the epithelium but otherwise unchanged, and the capillary vessels unbroken.†

According to the investigations of Dr. C. Schmidt, the blood usually reaches its greatest degree of concentration from the rapid drain of the water in the discharges, during the first twenty-four to thirty-six hours after the commencement of active symptoms, when the proportion of solid constituents was found from one to one and a half times greater than natural. The increase consists chiefly of the corpuscular elements, extractive matter, and the phosphatic salts.

You must keep in mind the fact that the changes I have thus far described are such as are found in cases in which death resulted during collapse from the active stage of the disease.

When death has been postponed until after reaction and the secondary fever, the autopsy will generally show more indications of inflammatory processes, more especially in the alimentary canal.

In such cases there is more general redness of the mucous membrane of the ilium, with an increase of the lymphoid cells and slight tumefaction of the glands of Peyer and Brunner. Numerous superficial follicular ulcers are also seen in parts that had been most denuded of epithelium in the past stage. In many of these cases the mesenteric glands are moderately enlarged with some degeneration of structure. The kidneys are

*See "Report on the Cholera in Boston in 1849," published by the authorities of that city.
†See Transactions of the American Medical Association, Vol III, pp. 75–6. Also Transactions of the College of Physicians of Philadelphia, Dec. 4, 1849.

found more congested and tumefied, with noticeable fatty degeneration of the tubular epithelium. In these cases also, the spleen, liver, lungs, and serous membranes in the chest have lost the shrunken and dry condition they present when death results directly from collapse, and may even show some degree of congestion and traces of parenchymatous degeneration. The only item of importance which has been added to our knowledge of the anatomical changes revealed by a study of the conditions found after death from epidemic cholera, since 1849, relates to the alleged finding of an organic germ or microphyte in the cholera evacuations which is represented as the special infectious agent or cause of the disease. Drs. Pettenkoffer, Snow of London, and others adopted the theory that the microphytes multiplying in the mucous membrane of the alimentary canal during the incubative stage of the cholera were discharged in large numbers with the evacuations in the subsequent active stage and were capable of impregnating the water in the soil, or adhering to damp clothing, and by undergoing further development out of the body through the agency of heat, moisture and decomposable organic matter, they become active and efficient agents in spreading the disease. That there are plenty of bacterial forms in the intestinal discharges during the active stage of cholera, is easily demonstrated by microscopic examination. During the epidemic in this city, 1866, I took many specimens from the discharges of my patients as soon as voided, and speedily subjected them to careful microscopic examination. Several of the specimens I kept from three to six days, repeating the examinations morning and evening. The bacterial formations were always few and very small at the first examination, but they developed rapidly both in size and number by keeping. There were plainly several varieties of these organic germs, but the ordinary spherical bacteria and vibrios were much the most numerous. After making a thorough study of these specimens, I extended my examinations to the thin evacuations in ordinary cholera morbus, cholera infantum, and the simple summer diarrhœa of infants. By this means I soon learned that every variety of organic germ or microphyte that I had seen in the evacuations from my cholera patients, was equally visible in any serous evacuation from the alimentary canal when treated and examined in the same manner. The correctness of the results of these examinations has been confirmed by the subsequent observations of many others. I am justified therefore in stating that there are no organic germs peculiar to the intestinal evacuations in epidemic cholera, and consequently no foundation for the theory that the disease is propagated by specific germs from that source.*

Diagnosis.—The only diseases from which cases of epidemic cholera

* The latest information on this subject, is from Dr Koch, chief of the German Scientific Commission sent to investigate the nature and causes of the severe epidemic of cholera in Egypt, during the past summer, 1883. He says after examining the products from twelve cholera patients and ten cadavers dead from the disease in Alexandria, that "no organized infective material could be demonstrated in the blood, or in those organs which, in the case of other infective diseases, are usually the seat of micro-parasites, viz.: the lungs, spleen, liver and kidneys. * * * * * The contents of the bowels and the dejections of the cholera patients contained extraordinary quantities of micro-organisms belonging to the most different varieties, none of which appeared in preponderating proportion. There was also an absence of other indications of a relationship to the disease-process." See Maryland Medical Journal for Nov. 10, 1883. While thus conceding that no micro-organisms peculiar to cholera were found either in the blood, the viscera, or the cholera dejections, the report from Dr. Koch claims the discovery of a bacillus or rod-shaped microphyte in the mucous membrane of the lower half of the ilium, which had penetrated the follicular glands behind the epithelium, and prolifercated between it and the basement membrane of the gland. These bacilli were also seen in the villi and in some deeper parts of the membrane. He acknowledges, however, that "putrefaction is able to produce in the intestine exactly similar bacterial growths." And as all his efforts to produce cholera in a variety of animals by feeding or inoculating them with these intestinal bacilli after isolation and cultivation, or by giving them fresh specimens of the intestine itself, entirely failed, we are yet without any positive evidence of the existence of a micro-organism peculiar to, and causative of, epidemic cholera.

need to be differentiated are sporadic cholera morbus and the choleraic and algid varieties of pernicious intermittents. From cases of cholera morbus, the epidemic disease differs, first, in very generally having a premonitory stage of painless diarrhœa from one to four or more days before the more active cholera symptoms commence, and second, in the more general suspension of normal secretory processes, and the earlier and more severe development of muscular cramps in a large part of the voluntary muscles. The failure of the voice and shrinking of the surface, is also much more marked than in cholera morbus. Yet I have repeatedly seen cases of sporadic cholera morbus, the symptoms of which so closely simulated those of well marked epidemic cholera, that had they occurred during the prevalence of an epidemic, they would have been regarded as typical cases of the last named disease. The known presence or absence of an epidemic influence, will, therefore, aid you much in determining your diagnosis in particular cases. From those cases of pernicious intermittent or malarious fever characterized by severe vomiting, purging and rapid prostration of all the processes and functions of life, cases of true cholera are to be distinguished by the preceding stage of cholerine or simple diarrhœa, the absence of rigors or a distinct chill at the commencement of active symptoms, the presence of more general and severe muscular cramps, and the co-existence of a recognized epidemic cholera influence. There is sufficient resemblance, however, between the active phenomena of a paroxysm of a pernicious choleraic intermittent and the active stage of cholera, to render it difficult for a practitioner who may see his patient for the first time in the midst of the paroxysm, to distinguish the one from the other by the symptoms. So true is this, that whenever cholera epidemics have invaded strongly malarious localities, the earlier cases have very often been regarded as malignant attacks of malarious fever; and some physicians of eminence have regarded the cholera itself, as only another phase of the more malignant effects of the same cause that produces the more common types of periodical fever. Some countenance is given to this idea by the fact that cholera epidemics have generally extended much more readily into malarious country districts, than into those destitute of that influence. But the differences in the phenomena of the initial stages, and still more in the anatomical changes as revealed by autopsies, as well as in the sequelæ, are sufficient to establish the essentially distinct and independent character of the epidemic cholera.

Prognosis.—If you exclude from the statistics of epidemic cholera all cases of cholera diarrhœa, and retain only such cases as develop active vomiting, purging of rice water character, and some cramps, you will always find a high ratio of mortality. Adopting this rule, and taking most of their statistics from cholera hospitals, nearly all recent writers place the mortality from this disease at from thirty to fifty per cent. This, however, gives an exaggerated idea of the fatality of the disease. But few cases of cholera are taken to a hospital until after the active symptoms of the disease have commenced, and from the rapid progress of the disease, a large proportion of them will have passed the stage most favorable for successful treatment before they arrive. To illustrate this fact I need only refer you to the details of admission to the special hospitals in the large cities of our country during the epidemic of 1849. For instance in five hospitals of this class in Philadelphia there were admitted an aggregate of 236 cases, of whom forty-nine or more than one-fifth were in complete collapse at the time of admission, and all died. Nineteen more were in partial collapse, of whom six died. While of the 168 admitted before direct symptoms of collapse had supervened only eight died. The

late Dr. D. Francis Condie of Philadelphia, who had charge of the Southwark cholera hospital in 1849, and had also had ample opportunities for treating the disease during the epidemic of 1832, makes the following statement which has an important bearing on the question before us. "From the official position which I held in 1832 and 1849, I had a very large field afforded for treating the disease. Now, in 1849, the percentage of mortality in all the cases of cholera treated by me in the Southern hospital, was *ten per cent*, and in all the cases treated by me in private practice—that is in the patient's own dwelling—rather more than *four* per cent. The cases referred to were all genuine, fully formed attacks of epidemic cholera. If I had included all cases treated by me of cholerine, the percentage in hospital practice would have been reduced to seven, and in private practice to less than two." *

My own clinical experience derived from an active and extensive practice in the cholera epidemic of 1849 in New York City, and in the epidemics of 1850, '51, '52, '54 and 1866 in Chicago, fully confirms the statements of Dr. Condie in relation to the ratio of mortality, both in regard to the cholerine and the fully formed attacks of epidemic cholera. It will be apparent to you, therefore, that if the cases of serous diarrhœa, technically called *cholerine*, are to be included in the statistics giving the whole number of cholera attacks in any given epidemic, then it must be conceded that there is a tendency in the milder cases to spontaneous recovery, and that under good treatment in private practice the percentage of mortality resulting from all classes of cases will not exceed eight or ten per cent. But if all the mild cases are excluded as cholerine, and only such are included in the statistics as have taken on the more violent symptoms of the active stage, the mortality under the most judicious practice will range from ten to twenty-five per cent; and in hospitals where from one-fifth to one-third of the whole number are already in complete collapse when admitted, the ratio of deaths may be increased to fifty or sixty per cent.

LECTURE LXIV.

Epidemic Cholera Continued—Its Treatment and Prophylaxis.

GENTLEMEN: Whatever may be the specific or efficient cause, or combination of causes, which produces epidemic cholera, the symptoms and clinical history show that the prominent pathological conditions are, a general impairment of that elementary property of the tissues called vital affinity, by which both the tonicity of the tissues and the natural molecular movements concerned in the processes of nutrition and secretion are diminished; an equal impairment of the functions of the vaso-motor nervous system, more especially that part of it connected with the vessels of the mucous membrane of the alimentary canal, and coincidently an increased excitability of the same membrane. It is this coincidence of impaired tonicity, vaso-motor paralysis, and increased suscepti-

*See Report on Practical Medicine and Epidemics in the Transactions of the American Medical Association, Vol. III, p. 112, 1850.

bility, that starts the undue exudation of the serous elements of the blood from the whole extent of the alimentary mucous membrane, carrying much of the epithelial layer with it, and furnishing the material for the copious discharges characteristic of the disease. To these primary and essential pathological conditions are added, as the disease progresses, the rapid thickening of the whole mass of the blood, the shrinking of the tissues, the muscular cramps, and finally the failure of oxygenation, decarbonization and circulation, constituting complete collapse. Or, if the morbid changes stop short of this, congestions take place in those portions of the mucous membrane most denuded of epithelium, followed by a low grade of inflammatory action, and secondary fever, of more or less danger to the patient. If these views concerning both the primary and secondary pathological conditions present in an attack of cholera are correct, they readily suggest certain rational and important objects to be accomplished in the treatment of each successive stage of the disease. These objects are, first, to restore the general tonicity of the tissues, to increase the activity of the internal vaso-motor influence, and lessen the undue excitability of the mucous membranes, in the early stage of the disease. Accomplishing these objects fully cuts short the disease and renders the further use of medicines unnecessary. Failing in this, the next leading object is to limit the serous exudation to such an extent, at least, as to prevent extreme thickening of the blood, and to maintain the more important secretory and eliminative functions in a state of activity. Still later, however, when the water and saline elements of the blood are already greatly diminished, the renal and other secretions nearly suppressed and the thickened and imperfectly oxygenated blood fast stagnating in the capillaries of the shrunken tissues, it becomes an object of paramount importance to replenish and dilute the blood by restoring, as far as possible, its wasted elements, and at the same time, to maintain the sensibility and action of the nervous centers of organic life

Finally, if your patient passes by the immediate dangers of collapse and a secondary fever is developed, you must combat the local intestinal, renal, or other hyperæmias and sustain general nutrition on the same principles and by substantially the same means that I pointed out for the management of the more advanced stage of enteric typhoid fever. Such, gentlemen, are the objects clearly before you for accomplishment in the different stages of a cholera attack, from the initial diarrhœa to the end of the secondary fever. And I need not add that on the promptness with which you recognize these objects, and the skill you display in selecting and applying the proper means for their accomplishment, will depend your success in the treatment of the disease. Neither is it necessary for me to assure you that no one remedy is calculated to meet fully the indications at any stage of the disease, much less at all stages. All acute general diseases present complex pathological conditions which change in their relations as these diseases progress through their successive stages either to the recovery or death of the patient. To attain the highest degree of success, therefore, you must so combine remedies as to meet the complex pathological elements, and so vary them as the disease progresses, as to preserve the accuracy of their adjustment to the changing conditions of the disease. The numerous statistics you find in your books in regard to the relative value of opium, alcoholic liquids, calomel, emetics, saline evacuants, bleeding, etc., are of no actual value simply because they are not accompanied by an accurate statement of the stage of the disease, the condition of the patient, and the coincident use of other remedies, at the time any one of the remedies named in the tables was being used.

The most favorable time for accomplishing the first objects I have named, is, the stage of premonitory diarrhœa and the first one or two hours after the active cholera symptoms have supervened. During the first of these periods, one of the most reliable combinations I have used, is the following:

℞			
	Acidi Sulphurici Aromatici	15.0 c. c.	ʒiv
	Magnesiæ Sulphatis	15.0 grams	ʒiv
	Tincturæ Opii	15.0 c. c.	ʒiv
	Elixer Simplicis	30.0 c. c.	℥i
	Aquæ	60.0 c. c.	℥ii

Mix. Give to an adult four cubic centimeters (fl. ʒi) in a little additional water every three, four or six hours according to the frequency of the evacuations, and keep the patient at rest. During each of the cholera epidemics in this city since 1849 I have used this prescription in a large number of cases of cholerine with the most satisfactory results. The sulphuric acid and aromatics furnish the necessary tonic influence to the tissues and a mildly stimulant effect to the vaso-motor nerves, while the opiate effectually allays the morbid excitability of the mucous membranes. I usually repeat the dose at the shorter intervals until the discharges have been prevented for twenty-four hours, and then increase the interval until the passages are limited to one in twenty-four hours, and are natural in color and consistence. If malarial influences were prevalent at the time, the intestinal discharges light colored, and the patient's tongue coated, I gave in addition to the foregoing prescription a pill or capsule containing sulphate of quinia, thirteen centigrams (gr. ii) and six centigrams (gr. i) of blue mass each morning and noon.

Another combination which I have sometimes used as a substitute for the aromatic sulphuric acid mixture, and with good effect is the following:

℞			
	Acidi Sulphurici Aromatici	15.0 c. c.	ʒiv
	Tincturæ Cinchonæ Comp.	60.0 c. c.	℥ii
	Tincturæ Nucis Vomicæ	15.0 c. c.	ʒiv
	Tincturæ Opii Camphoratæ	60.0 c. c.	℥ii

Mix. Give an adult four cubic centimeters (fl. ʒi) in a little sweetened water, every three, four or six hours until the bowels are regular. I might multiply formulæ intended for the accomplishment of the same general purposes, but the two already given are sufficient to indicate the nature of the remedies needed to correct the morbid processes in the first or preliminary stage of the disease.

When the active symptoms, vomiting, purging, and cramps, have commenced, I direct the immediate application of strong mustard sinapisms over the epigastrium and nearly the whole length of the spine; keep the patient in a horizontal position with dry warmth to the extremities, and give internally every half hour three milligrams (gr. 1-20) of strychnine and eight or ten minims of oil of turpentine, rubbed up with gum arabic, sugar and mint water, in the form of an emulsion. Immediately after each paroxysm of vomiting I also give a powder containing sulphate of morphia fifteen milligrams (gr. ¼), calomel, six centigrams (gr. i) and white sugar three decigrams (gr. v) rubbed together, and follow it by a small piece of ice instead of water or any other kind of drink. I mean to be understood literally when I say *immediately* after each paroxysm of vomiting, for the stomach cannot maintain a continuous effort to eject its

contents. Consequently if the powder is swallowed immediately after the contractile power of the stomach has been exhausted by a paroxysm of vomiting, a little time will elapse before another paroxysm can take place, during which the morphine will gain some impression on the nervous sensibility, and the calomel on the capillaries of the mucous membrane. If you delay, however, as nearly all nurses and patients will desire to do after each act of vomiting, until the patient has "rested a few minutes," or the "stomach has settled a little," such delay will usually be just long enough for the muscular coat of the stomach to regain its contractility and its cavity to have gathered a fresh accumulation of effused serum, and is, therefore, all ready for another paroxysm. Then if you give the powder or anything else it will be promptly rejected by vomiting as soon as it is swallowed. At the same time that I direct the foregoing treatment by the mouth, I also direct three centigrams (gr. $\frac{1}{2}$) of acetate of morphia, and six decigrams (gr. x) of acetate of lead, dissolved in about sixty cubic centimeters (fl. ℥ii) of water, to be used as a rectal enema, immediately after each intestinal evacuation.

In a large proportion of the cases that have come under my care very soon after the commencement of the active cholera symptoms, the plan of treatment just detailed has begun to moderate the violence of the symptoms in from two to three hours, and by continuing the same remedies at a little longer intervals, all active symptoms have ceased before the patient reached a dangerous degree of prostration. In the epidemic of 1866, I used in many cases the ordinary carbolic acid mixture in doses for adults of four cubic centimeters (fl. ℥i) after each act of vomiting instead of the powder of morphine and calomel.* During all this early part of the active stage of the disease, the patients were kept as constantly in the recumbent position as possible, their craving for cold water satisfied by frequent small pieces of ice, held in the mouth long enough to smooth the edges and angles and then swallowed. But if, either from failure of the remedies or from neglect of treatment, the serous discharges have continued until the surface is much shrunken, the extremities bluish, the pulse feeble, and the sweating copious, indicating much diminution in the relative proportions of the water and salts of the blood and consequent near approach of collapse, instead of continuing the remedies already mentioned, it is better to give at once a hypodermic injection of sulphate of morphia one centigram (gr. 1-6) and atropia one milligram (gr. 1-60), and endeavor to replenish the exhausted elements of the blood and maintain the susceptibility of the nervous and other structures by giving alternately, every fifteen or twenty minutes, fifteen cubic centimeters or a tablespoonful of strong infusion of coffee or tea, and of beef or chicken broth well salted with chloride of sodium or chlorate of potassium. If the first hypodermic injection does not promptly check the sweating, improve the pulse, and stop the vomiting, it may be repeated in from half an hour to an hour. At this stage, when the blood has become too thick to circulate freely, and too imperfectly oxygenated to sustain either nerve sensibility or secretory action, the influence of the atropia over the vaso-motor nerves of the periphery by which further exudation from the skin may be checked, and of the coffee or tea (or their active principles, caffeine or theine) in directly increasing the general susceptibilities, make them the most efficient agents we possess for resisting the further progress of the patient toward complete and fatal collapse. And when promptly resorted to in the stage indicated, in connection with

* See page 656.

the persevering use of small and frequently repeated doses of well salted animal broths to maintain the fluidity and oxygenation of the blood, they have produced better results than any other remedies I have used. As a rule, a strict horizontal position with dry warmth to the surface and extremities should be maintained throughout the whole of the active stage of the disease. All wet applications, after the first mustard sinapisms, only increase evaporation and thereby help to reduce the temperature, already too low, and consequently should be avoided. Active and persistent frictions, so frequently resorted to, also do more harm than good by the agitation and weariness induced by them. The best way to lessen the cramps, is simply to seize the cramping muscles and hold them under firm pressure a few seconds until they relax. At the same stage of the disease in which I have suggested the use of hypodermic injections of morphine and atropia, advantage has been derived from two or three thorough applications over the whole cutaneous surface of a dilute mercurial ointment in which was incorporated a liberal quantity of pulverized gum camphor and cayenne pepper. This application was used quite extensively in some of the cholera hospitals in New York City, during the epidemics of 1849 and 1854, and according to the reports with good effect.

If the stage of actual collapse finally ensues, the chances of recovery under any treatment will be very small. They will be best promoted, however, by continued rest and the faithful administration in small and frequent doses of the coffee, tea, and well salted animal broths, in the same manner as I have already mentioned. Under such treatment, I have seen a few cases of well marked collapse from which the patients recovered.

If, either before or after collapse, febrile reaction comes on, and a grade of secondary fever is established, accompanied by inflammatory congestion in the parts of the mucous membrane most denuded of its epithelium, it can be most successfully treated on the same principles and by the use of the same remedies, that I recommended in detail when speaking of the management of the second stage of enteric typhoid fever. I have now given you, in as few words as possible, the treatment for the several stages of cholera, in which I was induced to place much confidence, from an active personal experience in several epidemics. During that experience, I either tried, or saw others try, a great variety of additional remedies. I have resorted to venesection, cupping, emetics of chloride of sodium and mustard, camphor, saline evacuants, and astringents; and I have seen others use ice and salt to the surface, large doses of opium, quinine, calomel, alcoholic liquids, etc. In a few cases, characterized by unusually severe muscular cramps at the commencement of the active stage, I thought that thorough dry cupping over nearly the whole length of the spine afforded some relief. In three or four similar cases, a moderate venesection afforded some temporary relief, but nothing permanent. In three or four cases the local effects of salt and mustard on the gastric membrane, coupled with the revulsive effect of free vomiting, appeared to promptly check the further progress of the disease; but in other cases it only hastened on the stage of exhaustion. In some neighborhoods where there was a strong coincident prevalence of malarious influence, the use of moderate doses of quinine by hypodermic injection produced some good. But from all my past opportunities for observation, I am fully satisfied that the liberal use of alcoholic liquids, and what are called heroic doses of medicines of any kind are injudicious and productive of much more harm than good, in the treatment of every stage of epidemic cholera.

Complications and Sequelæ.—The active stage of epidemic cholera is

not often complicated by the co-existence of any other disease. And such attacks as end in convalescence without the supervention of secondary fever, usually allow of a rapid recovery. But when the active stage is followed by secondary fever, the inflammatory developments in the mucous membrane often affect that part lining the colon and rectum, causing decided symptoms of dysentery. Cases of this kind are noticed more frequently toward the close of a summer epidemic of cholera, than at its beginning. When such cases do occur they are to be treated in the same manner as I directed when speaking to you of the asthenic grade of dysentery under the head of inflammations of the alimentary canal. Perhaps the most important complication, which may continue also as a sequel, is such a degree of renal congestion as to cause the urine to be albuminous and very much diminished in quantity, or entirely suppressed. The secretion of urine is always much diminished during the active stage of cholera when the water of the blood is being actively drained through the bowels, but in most cases of favorable tendency, the secretion is resumed as soon as the intestinal discharges cease. When it is not, there soon follows more or less drowsiness, slight muscular twitchings, a soft, weak pulse, and a low temperature. If the suppression or extreme paucity of urine continues beyond twenty-four hours, the drowsiness generally deepens into unconsciousness or coma, with slow and irregular respiration, variable pulse, cold extremities, and sometimes sweating with a urinous odor. Unless relief is obtained by a resumption of secretion some time during the second or third days, one or two momentary paroxyms of general spasm or muscular rigidity occur, followed speedily by entire failure of respiration and circulation, and consequently the death of the patient. The best way to obviate such a result, to re-establishing the renal secretion is to re-dilute the blood by giving small and frequent doses of milk whey, buttermilk or animal broths; sustain nerve sensibility and cardiac force by caffeine, and endeavor to directly excite increased renal secretion by giving as freely as the stomach will bear, an infusion of juniper berries, uva ursi and galium, holding in solution the acetate or nitrate of potassium. In one case that came under my observation during the cholera epidemic of 1866, recovery took place after complete suppression had continued three days, under the treatment just indicated. In another case in the same epidemic, complete suppression of urine took place during the latter part of the active stage and continued nearly five days, and yet recovered, the secretion being finally re-established while taking a powder containing nitrate of potassium, three decigrams (gr. v), and calomel, thirteen centigrams (gr. ii), every two hours.*

Prophylaxis.—According to the most generally accepted doctrines in regard to the origin, and spread or propagation of epidemic cholera, it originates in some part of India or southern Asia, and is carried to other countries by human intercourse, the infection being supposed capable of adhering to clothing or merchandise; of being retained in the holds of ships; and especially to be propagated in the intestinal discharges of cholera patients. It is true, all concede that there must be a high temperature and certain bad sanitary conditions in the places or countries to which the supposed infection is carried, or it will not propagate itself or develop any epidemic of the disease. If you accept the correctness of these views, it logically follows that your chief prophylactic measures must be efficient quarantines, including thorough vessel and immigrant inspection, to prevent the importation of the infection; immediate and

* See Chicago Medical Examiner, Vol. VII, pp. 746–750, 1866.

thorough disinfection or destruction of all the discharges and clothing of cholera patients, to arrest the progress of an epidemic after it has commenced; and the enforcement of local cleanliness, ventilation and good water supply, for the purpose of removing the local conditions favorable for the propagation of the supposed infection. While the facts connected with the development of every epidemic which has appeared in this country are not capable of satisfactory explanation on the theory of imported infection, it is nevertheless a good rule to keep always in force such measures of inspection, isolation and quarantine as will prevent, as far as possible, the importation of all forms of disease and unsanitary materials. The theory that there is a specific cholera infection propagated chiefly in and by the cholera evacuations, is certainly unsupported by an adequate number of observed facts. Even the most learned and well equipped commissioners, who have visited Egypt for the special purpose of investigating the nature and causes of the severe cholera epidemic in that country during the past summer, have been wholly unable to propagate the disease by using either the fresh dejections or the bacilli found in the intestines after isolation and cultivation. Yet as all organic matter, separated from the living body under a summer temperature, is capable of speedily undergoing such degenerative changes as to evolve elements of a hurtful or dangerous quality, the serous discharges from cholera patients should be at once removed and so disinfected as to prevent further putrefaction or septic changes, as far as possible. But of all the prophylactic measures for preventing the spread of cholera, those which relate to the maintenance, for the community at large, of a pure atmosphere, a clean soil, and an adequate supply of good water, and for the individual or family, cleanliness of person and premises, good ventilation, wholesome food, and minds free from unreasonable fear and anxiety, are by far the most important. And there are these important advantages in keeping the minds of any community strongly impressed with the protective value of strict sanitary measures and with the necessity for the removal or avoidance of all sources of local impurities of either air or water, that they all contribute in an equal degree to protect the community from a great variety of other and more common diseases.

Of the protective measures of a personal character I enumerated freedom from unreasonable fear and anxiety; to which should also be added exemption from excessive fatigue, and the avoidance of all alcoholic drinks, whether fermented or distilled; and the adherence to a plain ordinary diet, including a fair variety of vegetable and animal substances, such as agree best with the individual when no epidemic exists.

Such members of the community as can not divest themselves of a certain feeling of dread, fear or anxiety about their personal safety during an epidemic, had much better go early and directly to some place exempt from any liability to a prevalence of the disease; for all experience shows that such mental conditions very greatly increase the chances of being attacked. On the contrary, a cheerful, confident tone of mind resting on clear convictions of duty and right, and aided by habits of temperance and virtue, will do very much to shield the individual from an attack of cholera during an epidemic, even of the most severe and protracted character. These remarks are as applicable to physicians as to the members of any other profession or calling in life.

LECTURE LXV.

Aqueous Fluxes from the Serous Membranes or Shut Sacs and Areolar Tissue: more generally called Dropsies. Their Varieties, Causes, Clinical History, and the General Principles governing their Treatment.

GENTLEMEN: The serous membranes of the body, unlike the cutaneous surface and the mucous membranes, are all shut sacs: and consequently, whenever serous fluid, or the watery element of the blood flows from these surfaces faster than it can undergo natural absorption through the blood vessels, it accumulates, and causes more or less distension of the sac itself. The same is true when the effusion or exudation of fluid takes place from the vessels of the areolar tissue or parenchyma of the organs. Accumulating faster than it can be absorbed, it fills up the tissue, causing it to be tumefied, or œdematous, by having its interstitial spaces distended with the effused fluid. As remarked in the previous lecture, when serous or watery fluid accumulates in any of these parts, it constitutes some form of what is familiarly styled dropsy. Particular names are applied, according to the membrane or point of the body including the accumulated fluid. In a strict pathological sense all those cases included under this head of serous fluxes into the shut sacs of the body are symptoms of some co-existing and preceding disease, and do not constitute individual diseases. They are susceptible of division into two classes: one, in which the serous flow is the result of inflammation of some grade in the membrane from which the effusion takes place. As you have learned, when considering the local inflammations of serous structures, one of the almost constant results occurring in the progress of the inflammation was an effusion in the second stage of the inflammation. And in cases where the inflammatory action assumes more or less of a chronic form, the amount of effused fluid becomes sufficient to create full distension of the cavity of whatever membrane is involved, and to remain incapable of absorption after the inflammation producing it had disappeared. Aside from the existence of inflammation as a cause of serous flux from the membranes lining the cavities of the body, and the areolar or connective tissue of the different structures, the causes, that usually result in serous flux or dropsical accumulations, may be arranged into two classes: The first class consists in the obstruction of the circulation in the vessels leading from the membrane from which the effusion takes place; as familiarly illustrated by those diseases of the liver which lead to obstruction of the circulation through the portal vessels distributed in the liver, causing undue fullness of the opposite distribution of the same vessel in the abdominal viscera.

But the same rule will apply to all serous surfaces, wherever the vessels carrying the blood from the part are such that they are capable of being obstructed in any part of their course so as to increase the fullness of the vessels of the membrane. This fullness causes the watery element of the blood to exosmose or transude through the walls of the vessels to the cavity formed by the membrane. The same is true in regard to dropsical accumulations in the connective tissues and parenchymatous structures. Any obstruction in the course of the vessel, to the return of the blood from the part causes habitual overfullness of the capillaries, leads to exudation of the watery elements, filling up of the tissues, and constitutes what is usually called, œdema or anasarca. This is well illustrated

by the pressure of the gravid uterus upon the iliac veins in advanced pregnancy; often so far obstructing the return of blood from the lower extremities as to cause them to become largely infiltrated with dropsical fluid, or œdematous. Tumors in the axilla will frequently produce the same effect, by pressure upon the veins returning the blood from the hand and forearm, causing more or less serous infiltration into the tissue, making the hand and arm throughout œdematous. It is thus that we have a variety of impediments, which produce dropsical accumulations, either in the shut sacs, or in particular tissues, purely of a mechanical character, without any necessary alteration, either in the composition of the blood, or in the special pathological condition of the structures involved in the effusion. The other class of causes which are liable to produce œdematous infiltration, or dropsical accumulations in the shut sacs, are such as produce impoverishment of the blood itself, causing the albumen and red corpuscles of the blood, one or both, to become largely deficient or below the natural proportion in healthy blood. In proportion as these constituents are diminished below the natural standard, the blood becomes thinner and approaches more nearly to the consistence of water. It is a physiological law, that the smaller blood vessels and capillaries, having their walls adjusted to the circulation of fluid of a given consistence, whenever the blood is rendered more fluid, beyond a given limit, its vessels allow exudation or transudation of the watery element through their walls into the interstitial spaces of the tissues, and from the membranous surfaces into the sacs of the membranes.

Perhaps the most familiar illustration of this class of cases is found in those diseases of the kidney which give rise to the excretion of albumen of the blood with the urine, as in Bright's disease proper, and the different conditions grouped under the name of albuminuria. One of the constant tendencies of such cases is, by the progressive thinning of the blood from the removal of a large proportion of the albumen and consequent increase in the relative proportion of the water of the blood, to induce general exudation of that watery element from the smaller blood vessels into the areolar tissues of the body, first, and, as the impoverishment still goes on, ultimately into one or more of the serous sacs of the body. The same result may be produced by excessive and repeated hemorrhages, by which both albumen and red corpuscles are reduced below their normal proportion in the blood. The continued action of malaria, as is well known, produces similar impairments particularly in reference to the red corpuscles, thereby greatly diminishing the viscidity of the blood and resulting in œdema, or dropsical effusion into the areolar sacs, in the more dependent parts first; and, as the impoverishment of the blood goes on, all the structures throughout become subject to œdematous or dropsical infiltrations. These illustrations are sufficient to show you, first, that all serous accumulations in the various shut sacs of the body and parenchyma of organs, are not only symptoms but results, and not distinct diseases, although they may receive distinct names. They arise either from inflammation of the texture from which the effusion has taken place, or from the mechanical impediments to the return of blood through the vessels from the parts in which the effusion occurs, or third, from absolute thinning of the whole mass of the blood until it approximates in its consistence that of water itself. Such a condition is generally the result of the impoverishment of the red corpuscles, or of the albumen, or of both. The two first of these causes lead to circumscribed dropsical accumulations, by which I mean accumulations directly limited to a particular serous cavity, or to some particular portion of the areolar tissue.

It will require only a moment's reflection on your part to see why these two classes of causes necessarily induce circumscribed or local dropsy. The first are inflammations directly of the part from which the effused fluid occurs and necessarily must be essentially local. The second, arising from obstruction to the return of blood through particular vessels, will affect only the parts to which these vessels are distributed, and consequently must be, primarily at least, local in the development of the dropsical result. The *vena porta*, having distribution only in the abdominal viscera, in its obstruction leads only, primarily, to abdominal dropsical accumulations. The iliac veins returning the blood sent to the lower extremities when obstructed will lead only to dropsical or œdematous infiltration into those extremities and so of all other parts. But, on the other hand, dropsy that arises from the third class of causes, those which produce impoverishment of the blood itself, rendering it too thin to circulate freely through the smaller vessels without exosmose or transudation, are not local. Their first beginnings are always determined by the law of gravity. The dropsical accumulation showing itself first in the parts most dependent or most distant from the heart or central organ of the circulation. Consequently this form of dropsical effusion in all the earlier part of its progress is changed, by change of position. The patient in the horizontal position during the night presents in the morning indications of dropsical infiltration in the bloated condition of the countenance, puffiness under the eyes and not infrequently pitting along the surface of the trunk of the body. But on assuming the upright position in the morning and during the day, these appearances will leave the face and upper part of the trunk, while the feet, ankles and limbs, will perhaps become filled up, so that in the evening they will be largely swollen from the dropsical infiltration. But placed on a level with the body, this disappears in a great measure during the night.

Those accumulations that result from alterations in the mass of the blood, are properly denominated general dropsy. Always pervading the areolar tissues first, in the parts most dependent and most remote from the central organs of the circulation, and as the case progresses, capable of increasing, step by step, until it permeates almost the entire structures of the body, before death takes place. The circumstances to which I have alluded are important in enabling you to make a correct diagnosis in the cases that may come before you in the general field of practice. The first step in the diagnosis of any case that may present itself, will be, to determine, if possible, the morbid condition, or disease, which has been the cause of the dropsy. A simple examination of the patient exteriorly, will enable you to determine readily whether the case is one of general dropsy, pervading the most dependent tissue prominently, and changing more or less by change of position, thus showing that it is influenced by the law of gravity, or whether it is confined to some particular portion of the body, or some particular cavity. If the first, it is general dropsy; if the second, it is circumscribed dropsy. In the first you are to look for the pathological condition giving rise to the dropsy, first, in alterations in the mass of the blood, and secondly, in the particular conditions which may have produced such alteration in the blood. In the second, or cases of circumscribed dropsy, it is comparatively easy to determine the disease or pathological condition which has given rise to the dropsical accumulation, by simply investigating as to the symptoms of inflammation in the part, or in the absence of any such symptoms, either present, or in the past history of the case, by searching for some mechanical impediment in the

course of the vessels leading from the part. On the other hand, in all cases of general dropsy resulting from impoverishment of the blood, you will most readily arrive at a correct discovery of the primary pathological condition by examining carefully the physical signs connected with the heart, having reference especially to the existence of structural or valvular lesions, capable of obstructing mechanically, the flow of blood through the cavities or openings of that organ, and in case no evidence of disease is found there, your attention should be turned next to the urine, examining it carefully by the proper tests, and if no evidence of albumen is found, or other condition of that secretion which would explain the occurrence of an excess in the relative proportion of the watery element of the blood, then your attention must be next turned directly to those causes of blood impoverishment to which I have already alluded; such as protracted malarious influences, repeated and copious hemorrhages, or some one of those peculiar constitutional forms of disease, denominated leucocythæmia, pseudo-leucocythæmia, and pernicious anæmia. In at least ninety-nine cases out of every hundred, however, the general dropsy, or rather the primary morbid condition which has led to it, will be found either in cardiac or renal disease, or in the action of malaria, or in copious and persistent losses of blood by hemorrhages.

Prognosis.—In the management of all cases of dropsy, the first object of importance is to arrive, as I have just stated, at a correct conclusion in regard to the pathological conditions which have led to the serous accumulations. Having done this, you are enabled, generally, to determine with much accuracy how far the case admits of a cure, and how far the patient can expect only palliation, or temporary relief. The dropsical difficulty, being only a symptom or result of some one of the pathological conditions to which I have alluded, if such condition, in any given case, is itself capable of being remedied, the removal of the dropsical accumulation will generally follow. On the other hand, if the dropsical accumulation is the result of such organic or structural diseases as are themselves incurable, the only benefit that can be conferred upon the patient will be the adoption of such measures as will temporarily diminish the dropsical accumulation, or in some measure retard the progress of the primary disease. Unfortunately, a large proportion of the cases of general dropsy depend upon organic disease of a permanent character, either in the heart or in the kidneys; while those cases that result from malarious influences, or from hemorrhages, are more frequently susceptible of permanent relief. And yet hemorrhages sometimes arise from incurable pathological conditions; such as cancerous or malignant growths, and hemorrhagic diatheses.

In the circumscribed dropsies, the prognosis will also depend entirely upon the nature of the local pathological conditions which have given rise to the serous accumulations. The larger proportion of those which have resulted from direct inflammation in the part are curable, as you have already learned from the discussion of the treatment of inflammation in the different organs and structures of the body. Those cases of circumscribed dropsy that arise from changes in the important internal viscera, such as cirrhosis of the liver, being themselves permanent or incurable, the prognosis is necessarily unfavorable; although in many of them much can be done, both to palliate the patient's condition, and to prolong life. Where the effusion has arisen from pressure upon the blood vessels returning the blood from the part in which dropsy occurs, relief may often be obtained by removing the cause of the pressure. A gravid uterus in due time relieves itself, and removes pressure from the iliac vessels.

Tumors, which may press upon the larger veins, as when developed in the axilla or in the groin, and sometimes in the abdomen, in such a way as to rest upon the iliac veins, or abdominal aorta, are not infrequently capable of being removed by surgical operations.

Treatment.—It is thus that treatment of all dropsy resolves itself primarily and largely into the adoption of such measures as are calculated to remove the various pathological conditions, which have given rise to the alterations in the blood, or that mechanically impede its circulation through different parts. Yet there is a large proportion of cases in which these pathological conditions can not be removed, and where the work of the physician is restricted to the effort to palliate the patient's condition by retarding the increase of the dropsical accumulations and sustaining the strength of the patient. It becomes therefore an important practical question at the bedside, how, in the more important cases that are likely to arise, this palliation can be most efficiently and properly accomplished. In other words by what means can we most effectually diminish the amount of dropsical accumulation or prevent its increase in the various forms of dropsy to which I have alluded. In all those cases dependent upon impoverishment of the blood, there are two rational principles to guide our treatment. One is, to so aid nutrition by the proper regulation of the diet and other hygienic measures as will improve the digestion and assimilation of food and consequently increase the nutritive elements of the blood; the other, to increase the action of those organs and structures which eliminate the watery element of the blood, and thereby diminish the relative proportion of that element, and increase the viscidity of that which remains in the vessels. You are well aware that the skin and kidneys are the structures through which the watery element of the blood is most largely eliminated. And whenever it is in excess, as it is relatively in all cases of impoverishment, by increasing the action of the skin and kidneys, and at the same time maintaining a reasonable degree of activity in the nutrition and formation of new materials for the blood, you must efficiently work in the direction of correcting the impoverishment and restoring the proper relative ratio between the watery element, and solid or organizable constituents of the blood, and will thereby directly lessen the tendency to further effusions into the tissues and cavities of the body. But action upon the skin and kidneys in such a way as to largely increase the elimination of water is capable of producing effects beyond that to which I have just alluded. It may not only restore the natural ratio or proportion in the different elements of the blood, and thereby stop the further effusion, but the watery element may be reduced, at least temporarily, below its natural proportion. Whenever such is the case, it is a physiological law that more active absorption of water takes place from the interstitial spaces, and such serous cavities of the body as may contain it, to supply the deficiency of that element in the blood. Consequently, whenever through diaphoresis, or diuresis the water of the blood is reduced below the natural proportion, active absorption takes place from the tissues and cavities, thereby lessening the accumulations and exudations wherever they may exist. And it is in this way that diuretics act when they reduce the effused fluid in dropsical cases. In cases where the kidneys are the seat of disease, and perhaps the primary cause of blood impoverishment and dropsical accumulations, little can be done by remedies directed to increase the action of those organs. But diaphoretics, warm baths and such remedies as increase largely the flow of the watery element from the cutaneous surface, may be still available and productive of good. The mucous membrane of the alimentary canal is

also a very important medium through which elimination of the watery element may be increased, by giving the patient frequent doses of hydragogue cathartics, such as elaterium and the saline cathartics, sufficient to cause from two to four copious watery evacuations in the twenty-four hours, and thereby rapidly diminish the watery element of the blood. Practically, however, there is objection to the use of hydragogue cathartics very actively or during any considerable length of time, on account of their tendency to cause loss of appetite, impairment of digestion, and ultimately, positive irritation of the mucous membrane, by which more injury is done to the digestive organs than is compensated for by the increased discharge of water in the evacuations.

In all those conditions of blood impoverishment and general dropsy that do not hinder the kidneys from being placed under the influence of diuretics, you will find it important to have some guide as to the kind of diuretics you should use. For instance, some cases of general dropsy are accompanied by small secretion of urine, and an imperfect elimination of the saline elements of that fluid, leaving them in excess in the blood and tissues of the body; in other words, cases in which there is imperfect elimination of the products of tissue disintegration. Such is usually the case with the general dropsies that follow attacks of eruptive fevers, or other general acute diseases. In these cases, where diuretics are used it is desirable to choose such as will not merely increase the excretion of the watery element of the blood, but will also promote especially the elimination of the products of tissue disintegration. For this purpose the saline diuretics are very much more efficient and reliable than those of vegetable origin. But in those cases of dropsy in which there is no retention of the elements or products of tissue disintegration, but a mere accumulation of the watery element of the blood, the vegetable diuretics and nitrous ether will be much more suitable for the purpose than the salines. The fluid extracts of galium, uva ursi, and the spirits of nitrous ether, aided more or less by digitalis, in many instances will be found more suitable in such cases and much better calculated to conserve the strength of the patient, and allow the continuance of efficient digestion, than the free use of the saline diuretics, such as the bitartrate, nitrate and acetate of potassium or the iodides. But in the large proportion of the cases of dropsy, both circumscribed, as when it exists in some one of the serous sacs of the body, and when it pervades the areolar tissue, your patient will arrive at a stage where your palliative measure will become unavailing; neither diuretics, diaphoretics, hydragogue cathartics, nor any other measures that can be devised relating to the administration of medicine, will longer hold in abeyance the accumulation of fluid, and some other measures must be adopted, or the effect upon some one or more of the important functions of the body will cause a fatal termination. In ascites, the fullness will become such as to crowd the diaphragm upwards, lessening the capacity of the chest, and by direct pressure upon the stomach, preventing the taking of food and its digestion to such an extent as to endanger the life of the patient. In hydrothorax a similar danger will result from a great degree of compression of the lungs. Accumulations in the pericardium, similarly endanger fatal pressure upon the walls of the heart. When the dropsy is thus circumscribed, and it can not any longer be either diminished, or the patient protected from serious danger, the proper resort is, to direct evacuation of the contained fluid, either by paracentesis, with the trochar, or by aspiration. The latter in the great majority of cases is preferable for the thorax, pericardium and

sometimes the membranes of the brain, while in the abdomen we may more freely use the ordinary trochar.

By thus directly removing the accumulated fluid, you will temporarily relieve the obstructions that had previously existed, and give the patient at least a period of comfort, before a re-accumulation can take place. Such re-accumulation, however, in all cases where it depends upon an incurable pathological condition, will sooner or later occur, and usually, the rapidity of the return will increase after each tapping or aspiration until, eventually, the patient reaches a stage of fatal exhaustion. Yet, by the judicious practice of such removal life may be prolonged very much beyond what it would be, if no such resort was had. In another class of cases affected with general, instead of circumscribed dropsy, the patient may arrive at a stage where life is put directly in jeopardy by the universal infiltration of the connective tissue of the body throughout its whole extent, and yet there is not such a degree of accumulation in any of the important serous cavities that tapping or aspiration from those cavities would afford the necessary, though temporary, relief. Generally some other mode of draining the connective tissue throughout must be resorted to, or the patient must be allowed to die. In such cases, during the last ten years, I have resorted, in a goodly number of instances, to a free incision on one side of each ankle, or a little above the internal malleolus; making the incision from an inch to an inch and a half in length, directly down through all the tissues to the immediate vicinity of the periosteum. By placing the limbs a little dependent, with oil cloth, or oil silk, to conduct the draining fluid off, so as to prevent the bed and clothes from becoming wet, and keep the patient comfortable in that respect, these incisions very seldom fail to produce complete drainage of the dropsical fluid, from the whole extent of the connective tissue of the body. And in some cases of incurable organic disease of the heart, they have relieved the patient almost entirely from four to six months. And when the incisions have healed, and the tissues have become filled up gradually, a repetition of the incisions has relieved the same case, sometimes, two or three times, thereby not only prolonging life for a whole year, or a year and a half in some instances, but rendering the patient most of the time comparatively comfortable. The same is true in cases that result from renal disease; unless the incisions are postponed so long that the elimination of urea has ceased, and uræmic poisoning has already developed in the nervous centers. In a few instances where the renal disease was supposed to have been permanent and incurable, complete drainage of the water from the tissues through the incisions in the ankles has resulted in the full return of the renal secretion permanently, and the consequent restoration of the patient. I have thus given you this outline of the varieties of dropsical accumulations, or serous fluxes into the shut sacs and connective tissues of the body, the different causes and pathological conditions that give rise to them, and the principles that should guide us in their treatment, both in reference to removal of the original disease, and in the palliation of such cases as admit only of this mode of treatment, and the prolongation of life. I will therefore next call your attention to the other division of fluxes which I denominate sanguineous fluxes or hemorrhages.

LECTURE LXVI.

Sanguineous Fluxes or Hemorrhages—Their Varieties, Causes, Consequences, and General Principles of Treatment.

GENTLEMEN: By sanguineous fluxes, or hemorrhages, I mean the flow or exit of blood from the vessels in which it is naturally contained. The most common causes of hemorrhage, are, solutions of continuity or rupture of the vessels, resulting from wounds, or injuries produced by mechanical violence. But all hemorrhages of this class are necessarily of a surgical character, and involve surgical treatment, consequently they are excluded from our present consideration. Leaving the hemorrhages that thus result from direct mechanical violence, all others may be divided primarily into two classes: First, those which result from increased flow of blood to some part, or some particular vessel, faster than the capillaries are capable of allowing its transmission. Second, such as result from some impairment in the function or structure of the vessels themselves. The first may be produced, either by severe exertion, by which the force and frequency of the action of the heart is increased, as in heavy lifting or any other violent exercise, or it may arise from simple increase of the muscular force of the heart in the systolic contractions, thereby sending the blood more forcibly, and in greater quantities to the parenchyma of organs and the periphery of different structures of the body, than is natural. In such cases, the organs which receive their blood in the most direct line from the heart, will feel the force of such increased activity in the greatest degree. Hence, most of the hemorrhages that occur from these causes are from the yielding of the walls of vessels either in parts within the cranium, or in the Schneiderian membrane, or from the vessels of the lungs. Another less frequent, but yet occasional cause of increased flow of blood into certain structures faster than the capillaries and small vessels are capable of conveying it through, is an increased activity of contraction, and consequent tension of the coats of the larger arteries leading in any given direction, but more frequently of the aorta itself. Cases of this kind I have observed, both in the thoracic and abdominal sections of the aorta, and though rare, yet in a few instances they evidently caused hemorrhages of much the same character as result from hypertrophy of the heart. All the class of cases to which I have now alluded, whether arising from the effects of protracted and severe exercise, or from muscular hypertrophy of the heart, or increased activity of the muscular structure of the larger blood vessels, are properly called active hemorrhages; indicating by that phrase, that they result from increased impetus or flow of blood to the part, and not from any special fault in the structure of the part from which the blood flows. The second class of hemorrhages, however, result from an entirely different class of causes, having no connection with any increased flow of blood to the part or increased activity in the mechanism of the circulation, but resulting either from mechanical obstruction, or impairment of vessels themselves. The obstructions may vary widely in their nature from each other. Perhaps those of most frequent occurrence are from inflammatory exudations. You have noted in the descriptions I have given of nearly all the acute inflammations, when speaking of the resulting anatomical changes, that among those changes in the texture of organs there was to

be observed in many cases the appearance of red corpuscles of the blood with the exudative material, constituting minute hemorrhages from the inflamed and obstructed capillaries.

These, however, are usually not included in the class of hemorrhages as described in your text books, but are simply spoken of as part of the anatomical changes belonging to the inflammatory processes. Another class of obstructions in the vessels, however, that may give rise to more positive hemorrhages, consist of emboli or fibrinous clots and shreds, either formed in some portion of the vessel, or carried into it from the central organs of circulation. Undoubtedly many cerebral hemorrhages occur in this way, and some in the pulmonary structures, and occasionally into the parenchyma of the spleen, kidneys and liver. A still more frequent cause of hemorrhage from direct obstruction of the vessels of the part consists of tubercular deposit. This kind of deposit, as stated to you when speaking of the subject of tuberculosis, has been more frequently found in the lungs than any other part of the human body. The pulmonary structure being exceedingly vascular, and its connective tissue distensible or elastic, the deposit of tubercular matter, whether in small granules, or in larger masses of more friable or caseous material, is very liable to be so placed as to obstruct completely the flow of blood, through not only the capillary vessels, but the smaller arteries and veins. And one of the most common incidents in the progress of pulmonary tuberculosis of all varieties, is the occurrence of hemorrhage, technically called hæmoptysis. Hence, it is often the case that these hemorrhages from the lungs take place early in the progress of the tubercular affection; so early, indeed, as to constitute the first thing to arrest the attention of the patient, and to impress upon him the idea that some serious disease is pending. Another mode of obstructing vessels sufficiently to cause hemorrhage is the pressure of tumors or morbid growths, or the enlargement of viscera in any direction, by which such enlargements are made to produce mechanical pressure sufficient to obstruct the natural passage of blood through the vessels. Still another class of pathological conditions which may give rise to hemorrhage, consist in alterations of the texture, or walls of the vessels of the part from which the blood flows. Chief among these alterations are fatty or caseous degenerations in the fibres of the muscular coat of the vessels. Such degeneration diminishes the tonicity or firmness of the texture, and allows the ordinary degree of blood pressure to rupture the vessel walls and permit the flow of blood either upon the surface, or directly into the parenchyma of the texture. Familiar examples of this kind of degeneration are found more particularly in the brain, in patients of sedentary habits or who have long been addicted to the moderate use of alcoholic drinks; by which the oxygenation and decarbonization of the blood is retarded, thereby favoring the caseous or fatty degeneration of the structures generally. Similar degenerations take place sometimes from age, without being preceded by objectionable habits or modes of life, but simply as the result of impaired nutritive changes in old age. A large proportion of the attacks of paralysis, especially of a hemiplegic character, that occur between the ages of forty and sixty years, as well as those of apoplexy, are from this form of degeneration in the structure of the coats of the cerebral vessels. Another alteration, or pathological condition of the vessels which favors hemorrhage is defective nutrition. In certain conditions of the blood and of the properties of the tissues, such as is illustrated in the disease called scorbutis or scurvy; in pernicious anæmia, and other affections in which the blood is changed in its quality, either by impairment of its coagulability, or by so great impoverishment of

its nutritive constituents as to be incapable of affording the elements of healthy nutrition, or of sustaining the vital affinity governing molecular movements and giving tone to the tissues. Consequently the actual nutrition of the vessel walls in some organs becomes so impaired, that they are incapable of resisting the pressure of blood in them; in such cases either a direct rupture of the vessel wall and hemorrhage may occur, or a transudation of the blood by exosmosis without visible rupture.

Still another condition of vessels is sometimes met with, that I may denominate atrophy or wasting of the vessel walls with dilatation. This is perhaps, the condition existing, to some extent, in all cases of varicose distension of veins; ordinarily however, cases of this kind do not give rise to actual hemorrhage. But when the part is so situated, that coincident with diminished nutrition leading to atrophy of the vessel walls, there is at the same time diminution of the natural amount of pressure from without on the vessels, as seen in advanced life in those instances where the brain begins to diminish in volume, leaving less pressure against the veins of the dura-mater, at the same time that the general nutrition of the veins is less than normal, we get that condition of impaired vessel walls constituting a thinning with small dilatations, ruptures and hemorrhages of a limited amount, constituting the disease which has been denominated pachy-meningitis interri, and which I have already described to you when speaking of inflammatory affections of the membranes of the brain. Although this condition was then described in the list of inflammations of the cerebral membrane, it was made evident that the morbid conditions, and especially the hemorrhages which occur in such cases often leading to some of the most prominent and dangerous symptoms that accompany that form of disease, arise not from inflammatory congestion, but from actual thinning of the walls of the vessels and the diminished pressure produced by the shrinking of the cerebral mass. Consequently the hæmatoma, as they are called, accompanying pachy-meningitis, are actual specimens of hemorrhage resulting from this atrophy of vessel walls and diminished pressure upon their exterior. Still another morbid condition of the vessels favoring the occurrence of hemorrhage is the impairment or suspension of vaso-motor influence, causing paralysis, either complete or partial, in the muscular structure entering into the composition of the coats of the vessels. You will readily see how this might favor such an accumulation of blood in the part as to result in the rupture of their walls and hemorrhage. The blood continuing to flow into the vessels by the ordinary force of the heart and receiving no additional impulse from contraction of the vessel walls, does not pass through the capillaries with the usual degree of rapidity, and consequently would tend directly to accumulate in the arterioles until over-distension might cause rupture and hemorrhage.

The last class of causes or pathological conditions I shall enumerate relate to the quality of the blood. As I remarked a few moments ago, when the blood is greatly impoverished in its corpuscles and albumen, rendering it unnaturally thin, it exhibits a tendency to permeate the vessel walls, producing petechial or hemorraghic spots. When such a condition of the blood exists coincidently with impairment of vaso-motor influence, there is decided danger of hemorrhagic exudation. Still more, however, is this the case when impairment of vaso-motor influence in the vessel is associated with that disorganized morbid condition of the blood which exists in well marked cases of scorbutus, the plague and other malignant fevers, and the bites of serpents. Such cases are generally accompanied by hemorrhages, both from the free surfaces, such as the mucous membrane of

the mouth, nostrils, stomach and intestines, and into the parenchyma of organs, or the cutaneous or subcutaneous tissues. In the latter, it gives rise to the well known appearance of patechial, purpuric and hemorrhagic spots, which often accompany the malignant types of disease. Hemorrhages, when arising from any one of the last class of causes I have enumerated, are called passive hemorrhages, in contra-distinction to those I have enumerated as active hemorrhages; the latter being the result of increased active flow of blood to the part, and all the former, however varied may be the pathological condition, having resulted from passive accumulation of blood in the part.

From this review, you will perceive that hemorrhages, like the serous fluxes of which I have previously spoken, are all simply consequences, or mere coincidences of preceding disease, and are therefore symptoms of no one morbid condition. You will also see clearly, from the number of different pathological conditions that may give rise to hemorrhage, that it is of the utmost importance, in the management of such cases as may arise in ordinary practice, to so study them, that the proper diagnosis as to the actual causes and pathological conditions existing in any individual case may be duly appreciated. For, the methods of treatment must, in all cases, be guided largely by the preceding and accompanying pathological conditions on which the hemorrhage, as a mere symptom, may depend. As I have already intimated, hemorrhages may take place either from free surfaces, or into the shut sacs of the body, or into the parenchyma of different organs and textures; but the symptoms which will be presented, will vary much in accordance with this division. When the flow takes place from free surfaces the symptoms resulting immediately from the hemorrhage will be almost exclusively such as are produced by the loss of blood, namely: paleness of the surface, softness and increased frequency of the pulse, diminished temperature or coldness of the extremities and surface of the body, great sense of weakness, with irregular sighing respiration, relaxation of the skin, with increased exudation or sweating, thirst, restlessness, vertigo, ringing in the ears, dimness of vision, and finally syncope and death from exhaustion. But when the blood, instead of flowing from the free surfaces makes its exit into shut sacs, or into the parenchyma of any of the organized structures of the body, another class of symptoms may be added to those I have already enumerated.

It is true, that if the flow is into one of the larger serous sacs, as into the peritoneal, or pleural cavities, the quantity of blood lost in filling up either of these cavities may produce all the direct symptoms that I have indicated, even to that of death from direct syncope. But whenever the hemorrhage takes place into the smaller cavities, and especially when it occurs in the parenchyma of organs it seldom produces its most disastrous effects from the quantity of blood lost, but from interruption of the function of the part immediately subject to the pressure of the accumulated blood. Even when the hemorrhage is into the cavity of the pleura there is perhaps more danger to life from the interference with the expansion of the lungs, and the carrying on of respiration, than from the quantity of blood lost. Still more would this be the case when the hemorrhage is into the pericardium. That sac would hardly contain a sufficient amount of blood to be fatal, merely from the quantity of the blood that would be withdrawn from the general circulation, but might readily prove fatal from the amount of pressure the accumulated blood would exert upon the walls of the heart. And if the hemorrhage is either upon the surface or in the parenchyma of the brain, where, from the bony encasement, there can be no distension of the walls and the pressure

of the accumulated blood must be brought to bear directly upon the cerebral substance, there is imminent danger of fatal consequences even from a very small amount of hemorrhage.

Hemorrhages taking place into the cutaneous and subcutaneous areolar tissue, while they may impede movements and interfere with the functions of the parts to some extent, and thereby cause the patient much inconvenience, are rarely either sufficient in quantity to prove directly fatal, or to interfere sufficiently with any vital function to produce the same result indirectly. From this general review of the pathological conditions giving rise to hemorrhages, the general lesions and symptoms which accompany them, both when from free surfaces, and the parenchyma of organs, you will readily perceive that it would be an unnecessary waste of time to take up the various hemorrhages and describe the phenomena or symptoms accompanying each in detail. Of those which flow from free surfaces, the most common are epistaxis from the Schneiderian membrane, hæmoptysis from the lungs, hæmatemesis from the coats of the stomach, hæmaturia from the mucous membrane of the bladder, menorrhagia from the uterus, and intestinal hemorrhage from any part of the mucous membrane of the alimentary canal below the stomach. When the hemorrhages occur into the connective or areolar tissue in any part of the body it takes the name of hæmatocele or blood tumor.

From what I have just said in regard to the symptoms which result from hemorrhage, both from free surfaces and into the shut sacs and parenchyma of organs, it requires but a single step of inductive reasoning to arrive at the three leading objects to be attained in their treatment. These are, first, the adoption of such measures as are calculated to arrest the further flow of blood; secondly, to mitigate or remove the consequences of such flow as has already taken place; and third, to remove as far as practicable the pathological conditions which have been the primary cause of the hemorrhage. If you see clearly the scope of these three objects in the arrest of the further flow, the mitigation or removal of the immediate consequences of that flow upon the functions that may be involved, and the removal of the original pathological condition from which the hemorrhage has arisen, you will be able, in any given case, to conduct its treatment on rational principles. In regard to the first of these objects, it will occur to you at once from what I have said, that the means for arresting the further flow of blood in any given case must depend, in part at least, upon the immediate cause of such flow. If the hemorrhage be one of the active class, dependent upon an increased impetus or flow of blood to the part, the first step in the treatment must be to retard that flow. Where it has arisen from some sudden or violent exercise, the exertion must be stopped, not only for the time being, but permanently. If it originates from increased cardiac action, whether from direct hypertrophy of the muscular structure, giving it increased power to propel the blood through the arterial system, or whether it be from temporary excitation of the cardiac structure, the first step in the treatment must be to moderate the cardiac action either by direct depletion (venesection), or by cardiac sedatives and rest. The force and frequency with which the heart propels the blood, must be diminished. If the patient is plethoric, in the middle period of life, or in youth, one prompt venesection may be one of the most efficient means for diminishing the cardiac force and arterial tension, thereby arresting the hemorrhage. In the great majority of such cases, however, the prompt administration of such cardiac sedatives as directly diminish the

force and frequency of the heart's action, will be sufficient for arresting the further flow without venesection. Among the most efficient of such agents are the veratrum viride, aconite, gelsemium, and perhaps I would be justified in putting with these the acetate of lead, particularly when given in as large doses as the stomach will bear. The same rule of treatment applies to those rare cases that appear to depend on increased arterial activity, especially when manifest in the coats of the aorta.

In all cases of active hemorrhage it is not only of primary importance to diminish the force and frequency of the action of the heart and the larger arteries, and keep the patient at rest, but it is also in some of the cases beneficial to moderately act upon the secretions by diaphoretics, diuretics and mild laxatives, thereby lessening the general fullness of the vessels. The diet should be simple, unstimulating, and moderate in amount. When hemorrhage of the second or passive class occurs, in fulfilling the first indication I have laid down, namely, to arrest the further flow of blood, there is often required a very careful and accurate discrimination between cases which may depend upon different pathological conditions of the vessels of the part. In all such as appear to be dependent on impairment of the vaso-motor nerve influence, inducing what might be termed in familiar language, relaxation of the coats of the vessels, and consequent retardation of the flow of blood through the capillaries, allowing it to passively accumulate without actual degeneration of structure in the vessels themselves, there are no remedies more efficient in directly arresting further flow of blood than such as directly increase the action of the vaso-motor nerves on the contractility of the vessels. Ergot, or its active principle, ergotin, is one of the most efficient of this class of agents. The tincture of the chloride of iron, persulphate of iron, and most of those remedies which are recognized as astringents, produce somewhat analogous effects by their presence in the blood, whether it be by acting on the vaso-motor nerves, or directly on the walls of the vessel themselves.

The first three of the agents named have been in my hands most efficient: namely, ergot or ergotin, the persulphate, and tincture of the chloride of iron. The activity with which they are administered must depend upon the urgency of the case, or the rapidity of the flow of blood. In cases of hemorrhage dependent on fatty, caseous or other forms of degeneration in the coats of the vessels, if not sufficient to produce immediately fatal results, will be influenced more by the use of such agents as improve nutrition, and at the same time increase vaso-motor influence. Strychnia and the mineral acids often act favorably upon this class of cases. They should be given in doses suited to the age of the patient and the condition of the digestive organs; and where there is a decided excess of fat, the administration of from three to five decigrammes (gr. v to viii) of chlorate of potash in a mucilaginous solution after each meal, by increasing the chlorine salts in the blood, and the consequent taking up of an increased amount of oxygen from the air cells of the lungs, will aid in oxidizing the fatty and carbonaceous materials of the blood, and thereby prevent further accumulation of these materials in the tissues. It may not aid in arresting hemorrhages in this class of patients but will lessen the danger of their recurrence after they have been arrested.

The same rules and class of remedies apply to the accomplishment of the first object in the treatment of all the forms of hemorrhage that result from impairment in the tone of the vessels. In those cases arising from toxæmic conditions of the blood, the remedies must be principally such as are calculated either to neutralize or remove the blood poison, in connec-

tion with such as increase the general tonicity of the whole vascular system. In other words the hemorrhage is but the symptom of the general disease and must be treated accordingly, that is, by controlling the pathological condition upon which it depends. I will detain you only to speak a few words in regard to that form of hemorrhage which takes place in connection with, or in consequence of what has been denominated the hemorrhagic diathesis or hæmaphilia. This condition is met with most frequently in children under the age of ten years, and occasionally at a later period, but very rarely in adult life.

There are various degrees of this diathesis, or tendency to hemorrhage. In the great majority of cases, it is not so strongly developed as to produce spontaneous hemorrhage from any part of the body. But whenever a solution of continuity has taken place by any wound, however trifling or small, there is no tendency to stop the flow of the blood, but it oozes almost indefinitely. The extraction of a tooth in such a constitutional condition often incurs very dangerous loss of blood. The prick of a pin or slight cut of a knife in any part of the body causes the blood to continue oozing, with no apparent spontaneous tendency to its own arrest. In some of these cases, especially in children from two to six, eight or ten years of age, the tendency to hemorrhage is so strong that it will occur spontaneously or without any injury whatever. I have met with some cases in which the flow of blood took place from the gums and mouth without any visible wound in the membrane lining the parts; more frequently from the Schneiderian membrane of the nostrils, slowly but continuously, until a most dangerous degree of exhaustion had occurred. I have met with several cases where the hemorrhage occurred in the same spontaneous manner, without any known provocation by wounds or bruises, into the subcutaneous tissue; more frequently of the lower extremities, causing numerous accumulations of blood and consequent tumefactions. These blood tumors are liable to present all those varieties of color that follow extravasations of blood into the tissues from ordinary bruises or contused wounds. In one instance two very large hemorrhages took place into the areolar tissue on the back between the scapulæ, one of which was at least 15 centimeters (5 inches) in diameter. The same patient had seven small ones in the lower extremities. It is not often that this class of patients have hemorrhages from the lungs, or from the stomach, unless there is a preceding wound or injury; but from the mucous membrane of the mouth, nostrils, and into the cutaneous and subcutaneous tissues, hemorrhages are frequent in their occurrence and are often sufficiently copious to induce a very dangerous degree of exhaustion. But it is particularly when they accidentally meet with some slight wound, that they are liable to such a flow of blood as to endanger life. A few of these patients I have had under observation for a series of years. One in the West division of the city was under my care at different times as occasion might require from the age of two up to that of ten years, and several have been similarly under observation for two, three or four years. I do not now remember any case under my own supervision that terminated fatally as the direct result of hemorrhages. But they all present some evidence of blood impoverishment, such as paleness of the lip, a sallow or cachectic hue of the surface and sometimes a puffy or semi-œdematous appearance of the face and extremities. When a considerable period has elapsed without hemorrhage they are usually free from symptoms of disease except such as would be common to a moderate degree of debility or lack of power of endurance.

Pathology.—The actual pathological conditions existing in these cases of hemorrhagic diathesis have never been reliably and accurately determined. Most of the older writers expressed their opinion that the essential defect was in the coagulability of the blood, or in its plasticity. But I have seen no case in which the blood escaping from the vessels directly in the progress of the hemorrhage, did not coagulate, or in which the solidified fibrin did not possess a fair degree of tenacity. Chemical analysis has not resulted in the discovery of sufficient deficiency either in the quantity of fibrin, the amount of albumen, or any other elements that may be supposed to be concerned in giving the blood plasticity to account for the constitutional defect. More recently, a better appreciation of the influence of vaso-motor nerves upon the blood vessels, and the part that the contraction of arterioles and smaller veins have in aiding the circulation, has led to the supposition that the defect in the class of cases to which I allude, was the arrest of the vaso-motor power, causing paralysis of the coats of the smaller vessels, thereby destroying their tendency to contract, and allowing passive exudation spontaneously; and when a vessel is severed leaving it without the power to contract sufficiently to close the orifice.

Another theory or supposition is, that the defect consists in the absence of the usual muscular fibers naturally existing in the coats of the arterioles and smaller veins. The absence of these would render the vaso-motor influence of no effect, there being no muscular structure on which the nerves could act, and the vessels themselves would be without the capacity to contract. The truth or falsity of this latter supposition ought to be demonstrable by dissection and microscopic study of the composition of the coats of these smaller vessels. I am not aware that this part of the investigation has been carried to the extent that it ought to be, and it affords a field in which some of you, who are skilled both in dissections with the scalpel, and in microscopic observation, may do well to enter upon the first opportunity that may be afforded you and study this part of the subject. My own impression is, that there is both a defect in the amount of muscular structure entering into the vessels, and in the vaso-motor nerve influence. In one case the one predominates, and in another case, the other. Whenever the cause depends upon a loss of innervation or defect in the vaso-motor nerve influence they are more amenable to treatment and more generally recover or arrive at an ultimate removal of the diathesis, and continue on through the ordinary period of life, while cases dependent on the absence of muscular fibers in the coats of the smaller vessels, are probably incurable.

Treatment.—For arresting hemorrhage in these cases when called at the time it is in progress, whether spontaneous or from some wound or injury, I have found no other remedies equal in efficiency to the internal administration of persulphate of iron and ergot, not given together, but alternately, in doses suited to the age of the patient, each once in from two to four hours, or from one to two hours apart, according to the gravity of the case, and the effect desirable to accomplish. In some of the cases there has been a coincident irritable and quick pulse, with slight febrile heat, in which the use of digitalis in connection with the ergot, has produced much better effects than the latter alone. A little boy, between three and four years of age, came under my care several years since, who had bled from the membrane lining the mouth and nostrils, till a dangerous degree of exhaustion had supervened. He had been subjected to treatment of some kind for two weeks without arresting the hemorrhage. On giving him a mixture composed of equal parts of tincture of digitalis

and fluid extract of ergot in doses of ten minims of the mixture in plenty of sweetened water, every four hours, and six centigrammes (gr. i) of the persulphate of iron dissolved in water, between each of the doses of digitalis and ergot, the hemorrhage was arrested, and then by continuing the same remedies at much longer intervals for two weeks, no return taking place, the persulphate of iron was discontinued, and the digitalis and ergot given every morning and evening for six weeks longer. The child in the meantime being kept chiefly upon bread and milk as a diet, and though allowed to go out, carefully avoiding excessive exercise. There was not only no relapse of hemorrhage during that time, but much improvement in his general appearance; the effects occasioned by the copious loss of blood having very much diminished, the treatment was then discontinued. He remained well for six months, when, without any known cause, the hemorrhage again commenced. The same remedies were again resorted to, arresting it in two or three days, and taking pains to keep up a moderate amount of their use for several weeks, he remained exempt from further bleeding for one year. At the end of that time I was again summoned, and found him with a return of his old trouble. He again recovered, however, under the treatment that had been previously adopted. I then induced his mother to continue the use of two doses a day of the digitalis and ergot for nearly six months, and although the family continued to live within my reach at least seven or eight years, I learned nothing of any return of the hemorrhage. In several instances I have known children to recover from this diathesis when it has been well marked and severe, so that spontaneous hemorrhage ceased to trouble them, but all through life there was great difficulty in arresting hemorrhage on occurrence of any accident that produced severance of the vessels. While I have succeeded better with the remedies I have indicated in directly arresting the flow of blood, and by judicious regulation of the diet, hygienic measures, and the protracted use of one or two doses a day of the digitalis and ergot, occasionally giving for a week at a time, the tincture of chloride of iron in addition to the other, still there are cases in which other remedial agents will be required. You should always make due inquiry in regard to the condition of the secretions, and remedy by suitable laxatives any constipation of the bowels, correct derangements of the stomach, taking care that the urinary secretion is kept free and natural, and the function of the skin as well performed as possible. All these things require attention, yet you must remember that the leading object of treatment for a considerable period of time should be to procure greater efficiency of the vaso-motor influence over the whole system of smaller vessels. Local applications other than those that are designed to produce temporary obstruction to the flow of blood by contact or pressure, appear to produce no beneficial result. The application of surgeon's lint saturated with persulphate of iron, and accompanied by a moderate degree of pressure, is practiced, and in some cases with benefit. When pressure can be brought to bear directly upon the open vessel, or vessels, it will temporarily obstruct the flow of blood. And it is possible, when the flow takes place from the mucous membrane of the mouth and nostrils, that the application of astringents, such as solutions of alum, acetate of lead, gallic acid, etc., may have some influence, although I have never seen instances in which their effects were well marked. I have seen the blood continue to ooze from the mucous surface of the gums and nostrils, directly in opposition to the contact of a strong solution of persulphate of iron held in contact by lint saturated with the astringent material. I have seen it ooze with equal freedom in opposition to the constant application of powdered mat-

ico, powdered alum and tannic acid. I have consequently been induced to attach little importance to local applications, other than that of simple pressure, where this can be brought to bear sufficient to temporarily oppose the flow of blood. Passive exercise by riding in the open air, plain, nutritious food, and mild currents of electricity for a few minutes each day, will aid in promoting the general health and nutrition, between the periods of hemorrhage.

LECTURE LXVII.

Neuroses: General Observations on the Physiology and Pathology of the Nervous Structures.

GENTLEMEN: In the lecture on the general arrangement of diseases given near the beginning of the present course, I stated that the third division of local diseases would include the consideration of all those morbid conditions of the nervous structures of the body, not essentially inflammatory in their nature. And, to those non-inflammatory, or functional diseases of the nervous structures, I gave the general name of neuroses. The nature of the functions performed by the nervous system, in its several parts, is of such a character that it affords a great variety of phenomena, or morbid conditions, and is so connected with the mind or thinking faculty of man, that it has constituted a more productive, and at the same time a more obscure and difficult field of study than the morbid conditions of any other part of the human body. Hence, the special cultivation of this field, during the last few years, has developed a great variety of divisions, or subdivisions, both of nerve functions and nervous derangements, bringing into use many additional names. Some of these are intended to designate morbid phenomena; others, more particularly to aid in making classifications founded upon the supposed pathological conditions, and still others, resulting from an effort to arrange them on the basis of etiology, and yet, without that clear and certain knowledge either of the subdivisions of structure, the special functions or the causation, to enable any arrangement to be complete on either of the several bases to which I have alluded. Consequently, if you refer to different authors on diseases of the nervous system, you will find it difficult to reconcile their differences, and oftentimes difficult to prevent being confused by the complexity of their nomenclature. It may contribute to a clearer and more ready appreciation of the various morbid conditions of the nerve structures, if we keep in mind the fact that nerve matter is capable of being primarily divided into two forms of anatomical structure; the one is essentially cellular *i. e.* consisting of aggregations of cells or nerve atoms, and the other linear or arranged into fibers, and that these anatomical differences in the primary structure, coincide with the division of function into sentient, and transmitting. The word sentient is used to indicate or to include both the capability to receive impressions, and to originate nerve force; the other includes simply the power of transmitting impressions either from a sentient center to muscular structure, or from one center to another. The power of transmitting to muscular structures results in movements, through muscular contraction.

These two great divisions of nerve structure have been designated as nerves of sensation and nerves of motion, from the days of Sir Charles Bell, and other early investigators in the physiology of the nervous system. You must remember, however, that the nerves of sensation, or more properly the sentient nerve structures, are again divisible into such as are connected either indirectly or directly with the cerebral hemispheres, and are consequently instruments of mind, and those which are connected with the various ganglia or aggregations of nerve matter, whether in the interior and base of the brain or in the spinal cord, or in the ganglia along different portions of the nervous cords that are not directly connected with the cerebral hemispheres in their ordinary function. The first of these divisions, or sentient nerves, connected with the cerebral hemispheres, and constituting instruments of mind, are those which convey to the mind impressions that are denominated sensations, and of which the mind takes cognizance more or less. Those which are connected with the ganglia or aggregations of nerve cells elsewhere than the cerebrum, and not directly connected with mental perceptions, nevertheless receive impressions and convey or give rise to the evolution of nerve force in response to those impressions. The aggregations of nerve matter in the form of ganglia upon the roots of the spinal nerves, along the *par vagum*, in connection with some of the more important nervous plexuses in the thorax and abdomen, in the spinal cord, and the aggregations of gray matter near the base of the brain, all receive impressions, and give rise to responsive nerve force through conducting fibers and result in the inducement of actions, both motor and otherwise, as perfectly without the consciousness of the individual, as those impressions are transmitted through the cerebral nerves to the cerebral hemispheres. But in the latter case the sensation or impression produced is mentally perceived and recognized, in the other the sensation is received and responded to, unconsciously to the mind. Hence, there is, properly speaking, voluntary sensibility belonging to the cerebral portion of the nervous system, and an involuntary or organic sensibility belonging to the non-cerebral or ganglionic portion of the nervous system. The same division exists in the motor nerve structures. The one class having their connections and relations with the sentient nerves belonging to the cerebral hemispheres whose action is subject to mental consciousness, and the others having their connection with organic nerve centers in different portions of the system and performing their office in the natural condition independent of mental consciousness or recognition. Many of the neurologists and physiologists of the present day divide still further the involuntary or organic nervous system, making one division of it under various names to correspond essentially with the excito-motor system of Marshall Hall, which was only an extension of the respiratory system of Sir Charles Bell.

In this they include all those sentient nerves and nervous centers which are connected with the performance of involuntary movements, in their natural condition independent of the will and yet within certain limits influenced by the will. For instance, respiration is a movement carried on by the involuntary nervous center in response to certain impressions made by the air upon the nerves of the membrane lining the respiratory passages and of the cutaneous surface, without any act of the will, or even of mental consciousness. And yet you all know that the mental portion of the nervous system enables us temporarily to interfere with these involuntary movements, so as to make them faster or slower, or to stop temporarily in obedience to our will. This control of the will, however, is

limited to a very brief period of time. To the same class belong the sphincter nerves of the bladder and rectum. They are capable of receiving and transmitting impressions, and causing an active relaxation of the sphincter muscles and of producing evacuations without any recognition of the mind, or any mental action, and yet, as in the case of respiration when the mind is awake and conscious, it is capable of regulating these movements within certain limits, but without absolute control. In this way you perceive that there is an important portion of the involuntary nervous system that performs its functions in obedience to excitation, and yet is in a limited degree under mental control.

It was this portion of the nervous system, having its chief center in the medulla oblongata, that Sir Charles Bell called the respiratory, and Marshall Hall, extending it to include the sphincters of the body, denominated it the excito-motory nervous system. At the present time another very important part of the nervous system is denominated vaso-motor; by which is meant, that part which presides over all the muscular structures connected with the blood vessels throughout the body. Their natural office is to receive impressions made by the blood upon the interior of the heart and the vessel walls, and in response to cause such movements of muscular fibers as will aid in moving the blood through the extended ramifications of the vascular system with a degree of uniformity. This part of the nervous system is distinguished from the excito-motory, of which we have just spoken, by the fact that we can exert no mental control over it, even in the most limited manner, still, in its function it is as much excito-motory as the other. Impressions are received, and nerve force transmitted in response to muscular structures commanding certain limited movements in the walls of the vessels and in the heart, without any mental recognition of the fact. There are also some eminent writers of the present day, who make still a third division of the involuntary portion of the nervous system, which they call the trophic nerves. To this part of the nervous system they attribute a certain degree of control over the molecular movements constituting nutrition and disintegration. They suppose the centers of this system to be chiefly in the ganglia upon the posterior roots of the spinal nerves, in some portions of the gray matter in the lateral cornua and portions of the spinal cord, and extending up into the brain through the medulla oblongata.

This class of physiologists or neurologists attribute to the influence of morbid conditions of this trophic system of nerves, most of those changes which constitute atrophy of various kinds such as progressive muscular atrophy and the arrest of nutrition under various circumstances. It is not clearly established, however, that there is a valid distinction between what is denominated trophic nerves and the vaso-motor. If you scan closely the writings upon this subject, you will find a failure to maintain a clear line of distinction between these two. On the contrary, while writing upon the trophic system of nerves, apparently unconsciously the writers are continually representing in the group the functions which, when studying the vaso-motor, they have said belonged to that. And it is extremely doubtful whether there is any portion of the nervous system capable of influencing molecular movements through the walls of the capillaries, and their addition to the tissues constituting nutrition, or their detachment again from the tissues and return back as waste matter,—I say it is very doubtful whether it can be demonstrated that any portion of the nervous system especially influences these atomic movements, except in an indirect way. The vaso-motor nerves regulating the tone and caliber of the minute arteries and veins, are capable of influencing continually the

quantity of blood flowing to, or through a given part. I think all the phenomena that has been attributed to the trophic system of nerves, can be quite as well explained through the action of the vaso-motor system, in its regulating the blood supply to any given tissue, as by the supposition that a separate system of nerves exists which influences direct molecular movements. I have thus called your attention to an outline of the physiology and anatomy of the nervous system, that you might have clearly before you the essential functions of nerve matter, namely, on the one hand, the reception of impressions and origination of nerve force, both voluntary and involuntary; and on the other, the function of transmitting impressions either from a sentient center capable of originating nerve force to muscular structure either voluntary or involuntary, or transmitting impressions from one nerve center to another. Keeping clearly in mind these functions of the nervous system, you will be able to study the morbid phenomena that arise from disturbance in any given part of the nervous system with more satisfaction than you could without this definite appreciation of their natural function. In studying the morbid conditions of the nervous system, we may divide them primarily into such as involve organic or structural changes, which is only another expression for alterations of nutrition, and such as are accompanied only by alterations or modifications of function without structural change. A large portion of the diseases included in the first division pathologically, we have already considered in presenting to you the inflammations, acute and chronic, that affect the principal nervous structures of the body. It is one of the essential features of inflammation, as you have already learned, that it involves both alterations of nutrition and of molecular movements, and consequently changes, at least for the time being, the structural condition; but passing by what we have already discussed under the head of inflammations, there are still changes of structure that do not necessarily depend upon inflammatory action. These changes may be arranged under three divisions, namely, those that are accompanied by loss of substance, or diminution of atoms, generally denominated atrophy; those which are accompanied by an increase in the amount of structure, and consequently increased bulk, denominated hypertrophy; and the third, consisting neither of atrophy nor of hypertrophy, but of a perversion in the molecular movements, by which the structure becomes changed in its composition; as when fat granules are deposited in the place of nerve cells, and when through perversion of the affinity existing in the tissue, the nerve cell is found to degenerate from its natural relation, as in the degeneration of nerve structure proper into the caseous or fatty material, or of the connective tissue surrounding nerve matter itself undergoing similar changes. These are called metamorphoses or transformations of tissue, and under these three heads, atrophy, hypertrophy, and transformation or degeneration of structure, we may embrace all those structural changes of the nervous system which are not inflammatory in their character. On the other hand, we have a class of important and frequently recurring affections of the nerves that are purely functional, or at least are accompanied by no appreciable change of structure. These are appreciable to the patient only in that portion of the nervous system connected with the mind, simply because it is only through the mind that we can recognize whether the influence is greater or less, more or less intense. But we may apply the same rule for studying the morbid phenomena as shown by resulting disturbances of involuntary function, just as readily as in those connected with the mind. The only difference is, that the one is readily appreciable by the individual patient, and the

other is not appreciable by his consciousness. But both are capable of being appreciated by the physician in his study of the resulting phenomena. The diminution of nerve sensibility, voluntary or involuntary, is named according to the degree of diminution, either paresis or anæsthesia. The first means simply impairment of sensibility, and the latter loss of sensibility. In former times it was simply denominated partial or complete paralysis of sensation. But the words paresis, and anæsthesia as applied to diminished sensibility or loss of it, you will find now more universally used in the books you consult. Again, another class of cases is characterized by an increase in the sensibility, whether mental or organic, above the natural standard, and this is generally called hyperæsthesia. Differing from both these, anæsthesia and hyperæsthesia, is perversion of the normal sensibility in the nerve structures of the body, in which unnatural sensations are produced, not capable of being classified as increased above, or diminished below, but only capable of being expressed by the word perversion. This condition is most easily studied in some of the special senses; the nerve of taste for instance may be perverted, so that in some instances, a sweet substance actually appears to the patient sour and the reverse. Perversions, to some extent, of taste are not infrequent. The same thing is illustrated in the auditory nerve giving rise to perversion of sounds, to a less degree perhaps in the optic nerve and its connections, giving rise to false colors. But what is thus easily studied because more easily appreciated in the nerves of special sense, exists in all the nerves of sensation, such as tactile nerves and those which are naturally affixed to the involuntary system; and not a few of those obscure chronic functional disturbances so often met with are dependent upon altered conditions of nerve sensibility in the involuntary nervous centers. If we extend this analytical study of the morbid conditions of the nervous system, and connect with it somewhat of the *modus operandi* of the causes capable of producing disturbance of nervous function, we might perhaps arrive at the conclusion that all the varied morbid phenomena, whether of anæsthesia, hyperæsthesia or perversion of nerve sensibility and transmissibility, were traceable to alterations in the properties of the nerve structure.

You will remember that in the preliminary lectures of the present course, I claimed that all organic matter endowed with vitality was possessed of two inherent or elementary properties, independent of any nervous influence, and inherent in the living organic atom or cell, and necessary to its condition of life from the first aggregation of matter or bioplasm constituting the germinal cell of the ovum up through all the stages of growth to the most complex of organic structures. And the necessity for acknowledging the existence of such properties is here clearly seen in the examination of the functions, whether normal, or abnormal, of nerve matter. For surely there is no other structure that can communicate to nerve matter sensibility or impressibility, and yet agents are constantly acting and making impressions upon the nervous structures. There is therefore an inherent susceptibility, or capacity to receive impressions from external influences, in the primary nerve matter. And in addition to this property inherent in the atoms of the structure, there is the property which regulates the movements of the atoms constituting the structure, such as the addition of new ones in the process of nutrition and the displacement of old ones in the waste, and this is denominated vital affinity. Now if we concede that the nerve structure, whether belonging to the cerebral hemispheres and consequently coming under the class of voluntary nerve matter, or purely organic or involuntary, is possessed of these two primary proper-

ties, we can easily perceive that wherever influences are brought to bear which diminish the susceptibility of the nerve structure, it would necessarily diminish its function as manifested in sensibility, or in originating nerve force. And if influences are brought to bear of such nature as to increase or intensify the primary susceptibility in the nerve structure, it would result in exaltation and increase, or hyperæsthesia of the sensibility and originating force of the nerve matter; and the same would be true of the function of the transmitting part of the nervous system. In the one case impressions diminishing the susceptibility would render the transmission slow, while those increasing it would quicken the movements and we would thus have a mode by which these two morbid conditions of function become explainable. All those conditions accompanied by paresis or anæsthesia would belong to causes that had diminished the primary, elementary property called susceptibility; and those which were accompanied by increase or hyperæsthesia would depend upon causes that had produced an increase of the same property. An intermediate class of causes, capable of making impressions and altering this property of susceptibility, would develop those phenomena that we call perversions. It requires but a step further in the study of the subject to perceive that the same classes of causes that thus may disturb function, if continued beyond a given length of time would almost necessarily result, on the one hand in corresponding diminution of molecular movements sufficient to result in diminished nutrition, or atrophy; on the other hand, persistence in the exaltation of susceptibility would develop an addition of new atoms constituting hypertrophy. While a perversion of impression would be precisely such as would correspond with the ultimate development of transformations or degenerations in the molecules of which the tissue is composed. These views are in strict consonance with clinical observation. It is well known that the effects of long continued perversions of function of a marked character, result in change of structure from altered nutrition. Not only are these views susceptible of being largely illustrated by direct clinical observation, but a study of the causes which are capable of producing either alterations in the structure not of an inflammatory character, or in the line of simple atrophy, hypertrophy and transformations, or the more temporary derangements of a purely functional character, will enable us to divide them into classes corresponding almost perfectly with the different pathological conditions to which I have alluded, namely, such causes as produce sedative impressions upon nerve matter and thereby diminish the manifestations of function, and if continued long enough, the development of structure also. Another class act as direct excitants, quickening function and ultimately leading to increase of structure. There is an intermediate class of cases, of a wide range, that can not be classed under either of these heads of simple nerve sedatives or nerve excitants, but which more or less impress the nervous system in such a way as to alter its natural action, constituting perversions, or morbid impressions. And, were it not for the fact that the nerve structures of the human body are subdivided into so many parts and exert an influence over so great a variety of functions, it might be possible to carry out a classification of nervous diseases, founded on these elementary views of the pathology of the nervous system. But, when you remember that each of these varied pathological conditions may be limited to particular parts of the nervous system, and that the phenomena which will be present within the body, will depend largely upon the particular function over which that part of the nervous system presides, you will see clearly why there is a seeming necessity for clinical purposes of adhering for the pres-

ent to the older, and more common division of non-inflammatory nervous derangements, such as grouping them under the heads of apoplexy, epilepsy, chorea, catalepsy, convulsions, tetanus, hysteria, paralysis, neuralgia, insomnia, mental diseases, etc. I shall, therefore, in the further consideration of this subject, proceed to consider the particular non-inflammatory diseases of the nervous system under the various heads that are familiar to the profession at large; beginning with those conditions of the brain which are included under the terms cerebral hyperæmia, cerebral hemorrhage and apoplexy

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LECTURE LXVIII.

Apoplexy – Its Varieties, Causes, Clinical History, Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The word apoplexy is used to indicate a loss of consciousness or coma, occurring suddenly without mechanical injury or the influence of poisons. For instance, when a patient is taken somewhat suddenly with feelings of vertigo, dimness of vision, a turgid condition of the vessels of the face, and speedily becomes unconscious with more or less stertorous breathing, with a slow intermittent or full and hard pulse, and loss of power over the voluntary muscular system, he is said to have an attack of apoplexy. In some cases, these symptoms may prove temporary, lasting from half an hour to one or two days, followed by slow, gradual improvement till they pass away entirely and the patient recovers, or the improvement may proceed only to the extent of restoring consciousness, with ability to use one part, or one half of the voluntary muscular system, while the other remains paralyzed. In such cases it takes the name of hemiplegia or paralysis, rather than that of apoplexy. In still another and large class of cases, instead of the symptoms beginning after a brief period of time to improve, the unconsciousness becomes more profound, the pupils of the eyes dilate, the breathing becomes very slow and stertorous, the vessels of the face and neck very much congested, of a leaden or bluish hue, the pulse sometimes soft and intermittent, at other times small, soft and quick, an entirely motionless condition of the voluntary muscular system, except perhaps an occasional automatic drawing up of a limb and letting it down again, relaxation of the sphincters, involuntary discharges and death. The latter might occur within even a few minutes after the commencement of the attack, or it might be deferred for one, two or three days. Attacks of this character are very rare in childhood and youth, but increase in frequency from the middle of adult life to old age. A very large majority of all the cases occur after fifty years of age. The disease does not appear to be influenced in a marked degree by season of the year, or by climate, and but little by sex. In my own experience I have met with more cases in males than in females; and a moderately larger number during the extreme cold seasons of the year, than in the warm. Having used the word apoplexy in its generally accepted sense to cover all those cases in which there is sufficient interference with the circulation of blood in the central portion of the nervous system to at least temporarily suspend its functions, it

must be admitted that pathological conditions varying much from each other are equally included by such use of the word, inasmuch as blood may accumulate in the nerve structure of some portion of the brain by simple hyperæmia, or venous congestion of the minuter vessels and capillaries and overwhelm function, or the vessel may be ruptured from some sudden and severe pressure of blood upon its walls, or from a previous impairment of the texture of the walls of the vessel itself, causing extravasation of blood sufficient by its pressure to wholly interrupt the further manifestation of function; or we may have emboli detached from fibrinous clots in the heart or some of the larger vessels and carried into the brain, plugging the vessels, so as to interrupt circulation and produce results as speedy and severe as would result from hemorrhage in the brain itself. Or we may have still another condition ; that of impairment of the vaso-motor nerve influence in the vessels of the brain, producing vaso-motor nerve paralysis, passive dilatation and consequent apoplectic pressure upon the nerve matter; thus making no less than four or five essentially different pathological conditions, all of which may be accompanied by such interference with the circulation through the nerve structures of the brain as to completely interrupt the manifestions of function or in other words to develop the ordinary symptoms of apoplexy. If we may thus have a variety of pathological conditions leading to the development of such symptoms as are called apoplectic, it follows that the causes of apoplexy may be equally various.

Causes.—In directing your attention to the causes of apoplexy I shall divide them into those which are predisposing, and those which are more directly exciting causes. The predisposing causes embrace all such influences as are capable of increasing in a marked degree the rapidity of the flow of blood to the brain on the one hand, and of such as, though not increasing the rapidity of flow to the brain, nevertheless impair the condition of vessels themselves in the brain, in such a way as to lessen their capacity to allow blood to pass freely through them. The other group of predisposing causes includes such influences as are capable of increasing the susceptibility or irritability of the brain substance. Among the more common or prominent of the first group of predisposing causes, or those which favor an increased rapidity of flow of blood to the head, are hypertrophy of the heart with increase of its muscular walls, dilatation or enlargement of the aorta, carotid and vertebral arteries by which their capacity for carrying blood is increased, and as all the older writers claimed, a physical development marked by a broad chest and a short full neck, indicating disproportionate development of the respiratory and circulatory organs. You need but a moment's reflection to see that with a given size or capacity of the capillary vessels of the brain, and increased size and force of the heart, the vessels leading directly from it to the head would tend to carry more blood to the brain in a given period of time, and consequently would place the patient in a condition continually favorable for supplying the vessels of the brain faster than they were capable of passing the blood to the venous side of the circulation and consequently produce either capillary congestion or rupture and extravasation of blood sufficient to overwhelm function and produce all the phenomena of apoplexy. Any conformation of the system favoring thus an excessive flow of blood to the brain would constitute a predisposing cause of one form of apoplexy. Among the more common of the second group of causes, or those which tend to impair the capacity and activity of the vessels of the brain rendering the natural flow of blood to it liable to accumulate and produce apoplectic pressure, are the use of alcoholic drinks, some of the narcotics,

particularly tobacco, the indulgence in sedentary habits in connection with full diet, and in fact all those hygienic conditions which interfere slowly with the oxygenation and decarbonization of the blood, or tend to impair the activity of the vaso-motor system of nerves. The first, those which interfere with the oxygenation and decarbonization of blood slowly and habitually from day to day, always favor the occurrence of fatty or atheromatous degeneration of structure in different parts of the body. When such degeneration takes place in the coats of the arteries or the smaller vessels of the brain they not only lessen the tonicity of the vessel walls and favor the occurrence of rupture and hemorrhages, but they also lessen the efficiency of reaction or contraction of the vessels with each impulse of blood into them, and consequently favor passive distension or accumulation of blood. The presence of alcohol habitually in the blood as in the case of habitual drinkers is well known to do this; both in diminishing the amount of oxygen taken up, and of carbon exhaled from the lungs; and no fact is better established than that such habits continued from year to year favor fatty degeneration throughout almost all the structures of the body, and frequently so in the liver, kidneys, muscular and fibrous structures of the vascular system. Sedentary habits act in the same direction by diminishing the amount of exhalation of waste matter, and the activity of the respiratory function in supplying oxygen to the blood. Tobacco, and other narcotic substances act more directly by impairment both of the respiratory and vaso-motor nervous systems in their sensibility and efficiency of action, and indirectly also favor to some extent fatty degenerations. Another cause of predisposing character belonging to this group consists in what might be termed the effects of old age in favoring the degeneration of structure in the vessels of the brain as well as an impairment of the vaso-motor nerve influence. You will thus see from the enumeration I have made that the group of predisposing causes capable of favoring apoplectic obstruction of the circulation in the brain are numerous and common. And your own observation and reflection will enable you to add many other influences, which, when continued from day to day through considerable periods of time would tend more or less actively to produce the same effects in one or the other of the modes I have already mentioned.

The third group of predisposing causes includes such as are capable of increasing the excitability and susceptibility of the cerebral structure, as in the preceding lecture, you will remember, I reminded you of the existence of inherent properties in nerve structure, as well as in all other living organic matter, one of which was the susceptibility to impressions. Whatever tends habitually to increase this susceptibility in the brain also increases the readiness with which the brain becomes hyperæmic or increased by fullness of blood. Perhaps there is no class of causes that predisposes in this direction so directly, as that of the habitual indulgence in violent passions and emotions of the mind, or in too protracted and intense intellectual application. Either of these indulgences, if continued for a considerable period of time, is capable of so increasing the excitability of the cerebral structure, as to establish an undue degree of fullness of blood or hyperæmia, which would only require the supervention of some strong exciting cause to determine positive apoplectic results. You see sometimes on the one hand, in individuals given to over-indulgence in passions and emotions, especially those more or less of a vicious character, that when suddenly overtaxed by some violent act of exertion or some unusually strong and violent fit of anger or passion, they are at once and suddenly overwhelmed with an apoplectic

attack. On the other hand it has many times happened that those who have passed the middle period of life, by indulging in protracted intellectual labor through considerable periods of time and depriving themselves of sufficient rest every twenty-four hours to secure recuperation, have fallen suddenly, sometimes in the midst of an intellectual effort in the forum or the pulpit in a sudden and overwhelming attack of apoplexy. You will perceive that all the various causes that I have mentioned are more frequently brought to bear in the middle and later periods of life than at any other, except perhaps that of hypertrophy of the heart, and the indulgence simply of the more violent passions and emotions especially of a vicious character. To act as predisposing causes proper, all these influences to which I have alluded must be continued habitually through considerable periods of time. Some of them, when acting with an unusual degree of intensity and suddenness, may become direct exciting causes. As I have already intimated, sudden and violent passions in an individual previously predisposed, is capable of bringing on an attack, or too protracted and intense intellectual effort when there is decided predisposition, may produce a similar result. Any other exciting cause being brought to bear upon those already predisposed, such as violent physical exertion or extreme muscular efforts in lifting, large doses of alcoholic drinks or other anæsthetics and narcotics, under similar circumstances of predisposition, may induce so full a suspension of the vaso-motor influence in the cerebral vessels as to determine an immediate attack. The presence of certain toxæmic agents in the blood are also to be considered as direct exciting causes, capable sometimes of producing apoplectic engorgements and death. Perhaps the most frequent of these agents are those derived from retained excretory elements of urine, in the progress of renal diseases of a structural character; as in the retention occurring in the advanced stages of granular or other degenerations of the kidney. Overloading the stomach with a full meal or with indigestible articles of food has sometimes by its reflex influence upon the vessels of the brain in persons previously predisposed, resulted in developing direct, and even fatal apoplectic attacks.

Symptoms.—From the number and varying nature of the causes, both predisposing and exciting, which I have mentioned, you will have anticipated that the symptoms which characterize attacks of apoplexy may vary much in different cases; and for convenience and accuracy of clinical history I will group all the cases into three divisions. Those belonging to the first group are such as are produced by causes favoring a direct increased determination of blood to the brain, and consequently may, by way of distinction, be called apoplexy from active determination of blood to the head. They are met with mostly in the middle period of life, and are either in persons of strongly sanguine temperament, or with positive structural changes in the heart giving it increased muscular force. In most of such persons the first symptoms of an apoplectic attack are sudden and extreme congestion of blood in the vessels of the face and neck, giving it a very turgid and reddened appearance, sometimes with sudden flashes of light like streaks or flashes of fire before the eyes, sense of vertigo, followed quickly by dimness of vision, frequently twitching of the muscles of the face, jerking of the eyeballs upwards, a falling of the patient to the floor if in a sitting or erect position and within a very few moments the supervention of entire unconsciousness, in which state the breathing is usually slower than natural, with more or less noise occasioned by the rapid gathering of mucus in the fauces, imperfect control of the tongue, and partial paralysis of the muscular system generally. In most

instances, though the pupils of the eyes are contracted at first, in a short time one or both become more or less dilated, and they are found not to respond to variations in light nor to maintain their natural parallelism, the one with the other. The face not only continues turgid with blood, but there is unusual redness over the whole surface of the body, neck and upper part of the chest, and in the severer class of cases the surface assumes more or less of a purplish redness, the extremities become cold, ends of the fingers leaden color and often cold, with a pulse at first firm, hard under the finger, full in volume, but slow and occasionally intermitting. If the case is proceeding rapidly toward a fatal result, the pulse every hour lessens in force, until it becomes soft, easily compressed, breathing very laborious and stertorous, entire motionless condition of the limbs, upper and lower, indicating general paralysis. The respiratory acts are protracted, with unusual depression of the abdominal walls with each expiration; sometimes at the beginning muscular twitchings, slight spasmodic action, and usually, as the fatal result approaches, entire general paralysis, involuntary discharge both of urine and fæces, and more and more impairment of respiration and circulation till both cease. Generally, the pupils become widely dilated after the first one or two hours from the commencement of fatal attacks. These changes in this class of cases may take place so rapidly that the fatal result is reached within from one to three hours, or they may be more slow in their progress, and terminate only at the end of the second, third or fourth day. But in the larger proportion, after continuing this latter period, there is usually either partial or complete recovery, by a slow, steady subsidence of all the bad symptoms, the patient recovering gradually consciousness, the power of muscular action, and finally convalescence. In the second group of cases to which I have alluded, the symptoms usually vary somewhat from those I have just described, more particularly in the condition of the pulse, and in the extent of the congestion of the face and external parts of the head and neck. The cases occur, not from increased impetus of blood to the head, but from failure in the condition of the circulation through the brain; and hence there is generally a supervention of the same vertigo, twitching perhaps of the muscles of the face, unsteady motion of the eye-balls, purplish color of the face, accompanied by entire unconsciousness, more or less labored and stertorous breathing, but without the intense congestion and redness of the face, and if congested at all only moderately so, and without the full labored pulse. On the contrary, the pulse is soft, easily compressed, generally slower than natural, somewhat unsteady and not infrequently intermittent. The pupils of the eyes become earlier dilated, but otherwise the paralytic symptoms, relaxation of the sphincters, involuntary discharges, proceed as in the cases already described. Or if they are less severe, accompanied by no marked rupture of vessels and actual extravasation of blood, there may be a slow recovery. The third class of cases is such as occurs in patients whose cerebral vessels have undergone impairment by fatty degeneration or otherwise, and consequently apoplectic engorgement into which they fall is purely of a passive character. In those of less degree of severity there will be but little fullness in the vessels of the face and neck, giving rather a purplish hue. The pupils of the eyes are dilated almost from the first, breathing unsteady and troubled at first, but not entirely stertorous, though less frequent than natural, but gradually passing on to a stertorous, irregular character in those in which the weakness of the vessels is such as to cause minute extravasation of blood. When such extravasations occur more freely there is sudden interruption of consciousness, with the face

and lips more frequently blanched or pale; pulse extremely weak, surface generally cool, the fingers and toes rapidly become bluish and cold, with entire paralysis of the whole muscular system as indicated by absence of all muscular movements, immediate relaxation of the sphincters of the bladder and rectum, and speedy death; the patient sometimes giving but one or two gasps for breath. These are cases where from previous impairment of the walls of the vessels in some portion of the brain, rupture takes place, and a sufficient degree of hemorrhage to immediately overwhelm all the functions of the brain with direct pressure. Occasionally a case of apoplexy may occur, as I have already mentioned, from emboli. Although these are much more liable to produce obstruction in only a limited portion of the brain, and to result in paralysis than in full apoplexy, yet sometimes the latter may be the result, because of fibrinous clots plugging up cerebral vessels, of such size as to suddenly deprive the brain of a large portion of its supply of blood, and therefore equally suddenly deprive the patient of consciousness and cerebral action. Death may be almost instantaneous. Or if the vessels obstructed are smaller, and the circulation interrupted through more limited portions of the brain, there will consequently be less complete suspension of its function, which may allow the re-establishment of circulation in collateral vessels and a slow recovery, either partial or complete.

Anatomical Changes.—From the description I have given both of the causes and of the symptoms of apoplexy in its varied forms you will anticipate that the pathological changes accompanying such disease will be varied, both in their extent and in their character. Where death has resulted from apoplectic engorgement of the brain in the class of cases I have described as resulting from active determination of blood, the brain may be found in either of two conditions: first, that of intense capillary engorgement of the smaller arteries, veins and capillaries with blood, making the cerebral substance redder than natural, and the cut surface to ooze blood from a much larger number and larger sized arteries and veins, than in the natural condition. Examined more closely, under proper magnifying power the venous portion of the blood will be found to have exuded or extravasated into the cerebral texture, with perhaps only here and there evidence of the extravasation of the red corpuscles and of the leucocytes. Such are cases in which the suspension of function has been complete, and fatal to the patient by the intensity of the engorgement of the minute vessels with only the addition of serous exudation into the textures. Sometimes this has been termed by different writers, serous apoplexy. In other cases of this same class derived from active determination of blood to the brain in addition to what I have described as the intensity of the engorgements, there will be found numerous minute hemorrhagic exudations, from rupture of the smaller vessels in many places, and constituting true but minute points of hemorrhage. In still other, but a smaller number of cases, the rupture of one or more larger vessels may take place, and a more decided hemorrhagic extravasation occur, giving rise to the formation of a clot imbedded in the cerebral substance, or upon some part of the surface. In examining the brain in those cases which belong to the second group, or such as have been accompanied by impairment of the cerebral vessels, in addition to the appearance of accumulation of blood intensely filling the capillary vessels, together with either serous or sanguineous exudations or both, there will be found, on minute examination, in many of them, all the appearances of fatty degeneration of the coats of the vessels, more especially in the parts of the

brain that have undergone the greatest degree of engorgement, and wherever ruptures have given rise to hemorrhagic extravasations. These degenerations will vary of course in different patients both in regard to the kind and extent of the structural changes. In some cases they are easily traced, not only in the connective tissue and muscular fibers of the vessels, but also in a less degree in the neurilemma of the nerve structure itself.

Diagnosis.—There is little difficulty in making a reliable diagnosis between apoplexy and other forms of disease of the brain. To distinguish it from all the varieties of inflammation of the brain and its appendages, you have only to compare the symptoms I have mentioned with those that I gave in the lectures upon the subject of inflammation of those structures. The suddenness of the supervention of unconsciousness without any preceding pain, fever or delirum, are so unlike the phenomena of inflammation, that it is hardly possible to confound the one with the other. The diagnosis between sudden hemiplegic attacks and apoplexy can not always be made at the first moment of the attack; both may be dependent upon the same class of causes and the same pathological conditions and in the first onset the symptoms will be identical.

But in the hemiplegic attacks entire unconsciousness usually is of brief duration, and in a few hours, at most, the patient begins to show imperfect symptoms of returning consciousness, and perhaps at no part of the time has failed to continue moving one arm or one leg, while the other has remained motionless. But in real apoplexy, there is generally, in addition to unconsciousness, an almost equal impairment or suspension of muscular action and motion on both sides of the body. It is only during the first few hours of the case, that there is difficulty in determining whether it is to be called true apoplexy, or hemiplegia. Almost the only conditions which might trouble the inexperienced observer in diagnosis, are the profound influence of narcotics and anæsthetics. Some of the phenomena of profound stupor from alcoholic drinks resemble an apoplectic condition. I have seen some of these cases of profound stupor from intoxicating drinks in which the face had a purplish or leaden hue, a purple hue under the nails and ends of the fingers, a labored and slow breathing, a compressible, slow and variable pulse corresponding closely with many of the cases of apoplexy, dependent upon impairment in the efficiency of the circulation through the brain. But on close examination in all these cases, the pupil of the eye was found less changed than in true apoplexy. In a majority of them it is slightly dilated from the effects of alcohol, but not nearly so much as is usually the case in apoplexy, and the eyeballs almost always maintain their parallelism. It is very rare that there is not also a distinct alcoholic odor recognizable in the breath. These are circumstances which will, in a large majority of cases, enable you to distinguish accurately between cases of profound intoxication, and that of apoplexy. Profound stupor, or narcotism from opiates, also sometimes may lead to doubt or to hesitation in comparison with apoplexy. There is, however, this difference in almost all instances: that opiates produce close contraction of the pupils of the eyes, whereas apoplectic attacks sufficiently profound to cause actual paralysis, and other conditions, compared with extreme narcotism, are accompanied by dilatation of the pupils, and a failure to respond to any alterations in the intensity of light.

LECTURE LXIX.

Apoplexy Continued—Its Prognosis and Treatment.

GENTLEMEN: If what I stated in the preceding lecture in regard to the pathological conditions of the brain involved in different cases of apoplexy is correct, it follows, necessarily, that the disease in all its varieties is one of extreme danger and terminates fatally in a very large proportion of the cases that occur. When the disease is caused by active determination of blood from any cause, without previous degeneration or impairment of the functions of the cerebral vessels, if seen and promptly and judiciously treated almost immediately after the development of the symptoms have commenced, the disease may not infrequently be arrested. Indeed, with very prompt attention on the part of the physician, all the cases of that class, except such as are accompanied by positive rupture of vessels and extravasation of blood, may be relieved. Unfortunately, however, many of them may be so far distant from their physician, that the stage of intense capillary engorgement will have given place to exudation, so that practically a large proportion of this class of cases will terminate fatally, not so much from necessity in the nature of the attack as from the very brief period of time in which remedial measures can be used with success; this particular brief period being the one in which the vessels of the brain are only intensely engorged and before either serous or sanguineous exudation has actually occurred. Undoubtedly, in some cases, recovery has taken place when the treatment has been commenced even after some degree of serous exudation. Relieving the fullness of the vessels themselves, the serous exudation has been re-absorbed and removed. But as might be expected where the attack of apoplexy has been preceded by impairment of the texture of the cerebral vessels, from degeneration through long continued action of predisposing causes, very few are capable of surviving a full apoplectic attack. It is otherwise, however, with a limited class of cases in which the attack has resulted from impairment of the vaso-motor nerve influence as the primary pathological condition, and the apoplectic condition has come from passive dilatation of the vessels and consequent extreme capillary engorgement. These are cases in which, if they could be properly diagnosticated and treatment practiced at once, efficiently, for the purpose of restoring a more active condition of the vaso-motor nerve influence, they might be arrested and a speedy recovery secured. You will perceive that there is necessity for a careful diagnosis, not between the apoplectic condition and some other disease, but between those cases of apoplexy arising from passive engorgement of cerebral vessels from failure of vaso-motor nerve influence, from those active cases in which the accumulation has taken place from active determination of blood to the head.

Without such a diagnosis you would be entirely at a loss for a choice in the class of remedies applicable to each individual case. Nothing is more plain than that those remedies most efficient in relieving or arresting the progress of an active determination of blood, causing hyperæmia of the brain, if applied directly to a case of passive accumulation of blood, under a suspension or impairment of vaso-motor nerve influence, would only increase the risk of a fatal result in the latter, and *vice versa*. It is therefore not only necessary, in studying the diagnosis and prognosis in

cases of apoplexy that they be studied in relation to the general differentiation of apoplectic conditions from other diseases, but in reference to differences between one class of cases of apoplexy and another. This involves the necessity for a careful inquiry into the previous condition of each individual patient, and the circumstances and influences that have been actively at work with them during, perhaps, months previous to the attack. As a general rule, the prognosis in apoplexy must be said to be unfavorable, yet as I have already stated some cases are capable of recovery.

Treatment.—As the essential phenomena of all forms of apoplexy, except rare cases caused by emboli, depend primarily upon pressure on the cerebral substance, and as this same pressure constitutes the chief source of danger to the life of the patient, the adoption of such measures as are calculated to relieve this morbid condition constitutes the leading object of treatment in all cases where the physician is called to the patient during the early stage of the disease. It matters not whether the pressure is the result of intense capillary congestion, serous extravasation, or hemorrhagic exudation, it is the pressure in each case that suspends cerebral function. The second indication to be fulfilled in the management of cases, consists in the adoption of measures to hasten the re-absorption of whatever exudations or extravasations have taken place, as the second step in the pathological changes. The third indication to be kept in view in the management of all such cases as do not terminate fatally, is to promote, as far as possible, the removal of the special morbid conditions which may have contributed to produce an attack and which by their continuance would directly increase the ordinary predisposition to a relapse. These three distinct objects to be accomplished in the management of apoplexy should be kept in view, and each should receive due attention; and the judgment and discrimination of the practitioner is to be exercised to the fullest extent in choosing the means best adapted for accomplishing those purposes in each individual case.

In former times, before pathological anatomy had been studied with the care which has been bestowed upon it in later years, it was an almost universal custom to commence treatment when called soon after the seizure of the patient, with the abstraction of blood, with but little regard to the prior history of the patient, or what might be the special pathological condition existing in the brain. You will readily see from the discrimination we have given of the pathological changes and symptoms, that this remedy, if practiced to any degree in all that class of cases which are characterized by degeneration of the coats of the vessels and structural alterations in the substance of the brain, or still more in those where the primary step has been impairment or suspension of the influence of the vaso-motor nerves, it must be limited in amount, and done with extreme caution, only in the very first beginnings of the attack, and then the effects, so far as affording relief are concerned, unless followed promptly by remedies of a different character, would prove only temporary, and the patients would speedily relapse into a more profound condition of coma, than before the abstraction of blood. But in all those cases occurring in the early and middle part of adult life, having their origin in such conditions of the heart or blood vessels as give rise to excessive flow of blood to the brain, the prompt abstraction of blood by venesection is the remedy above all others best calculated to check the progress of the disease by relieving the vascular fullness before any considerable exudation, either serous or hemorrhagic, has taken place, and consequently should be resorted to, in that particular class of cases with the least possible loss of time. The rule which will constitute your best

guide as to the amount of blood to be drawn is to make a free opening into the vein in the arm so as to allow the blood to flow in a pretty full stream, and suffer it to continue until the respiration and pulse become more steady and natural in quality, and the congested condition of the face subsides. Then the bandage may be removed from the arm and the flow of blood stopped. During the time of bleeding it is well to have the head and shoulders of the patient elevated somewhat on pillows, and when the flow of blood ceases, remove the pillows and let the patient into a nearly horizontal position.

In this class of cases the bleeding should be followed as speedily as possible by such arterial sedatives as veratrum and aconite, in such doses and with such frequency of repetition as will insure an early and free sedative influence upon the circulation, with a view of perpetuating the effect that has been produced more directly by the abstraction of blood. While doing this, such laxatives or purgatives should be given, if the patient can be induced to swallow, as will produce early and free movements of the bowels. Liberal doses of the saline cathartics, or one full dose of six decigrammes (gr. x.) of the mild chloride of mercury, followed in two hours by a saline cathartic, may be preferable to the saline without the mercurial. In most of this class of patients, there is increased heat of the head, and cold applications may be made there, while warm applications or sinapisms should be kept to the extremities. After the bowels have been freely opened, there is probably no remedy that will be more efficient in lessening the tendency to serous exudation into the texture of the brain, and at the same time encourage liberal action of the kidneys, than moderately full doses of the iodide of potassium. The iodide of potassium and cardiac sedatives should be continued, being guided as to the activity of their administration by the respiration and pulse of the patient, till consciousness is well restored. Then, if symptoms of debility appear, or the action of the heart becomes quick and rather weak, digitalis may be given in connection with the iodide of potassium, instead of continuing veratrum or aconite. If after consciousness has been restored, the patient exhibits a considerable degree of restlessness, and indisposition to sleep, the bromides and belladonna will be more likely to induce a fair degree of rest, and with less risk of doing harm, than any preparation of the opiate class. In some cases in which a prompt free bleeding has been attended at the beginning with partial relief of the cerebral pressure, in from twelve to twenty-four hours the patient ceases to improve, and exhibits an increase of the symptoms of congestion and pressure, the application of leeches to the temples and mastoid spaces, sufficient to produce pretty free local bleeding, will frequently be of much advantage, and be safer perhaps than a repetition of the bleeding from the arm. While treatment by direct and active depletion, arterial sedatives and active evacuants, such as cause free movements of the bowels and secretion from the kidneys and skin, constitute plainly and unmistakably the appropriate treatment for the class of cases of apoplexy dependent on active determination of blood to the head, even where there may be more or less exudation, either serous or hemorrhagic; in all those cases in which the disease has supervened, not from active determination of blood, but from some cause which has impaired the action of the vessels in the brain, the question of the direct abstraction of blood either by venesection or leeches is one of no small difficulty to decide, especially in some of the cases. For instance, in such as have been induced by excessive and protracted mental exercise, or that class of causes which I have described as calculated to increase cerebral excitability, together with all those cases that

may have originated with paralysis, or impairment of the action of the vaso-motor nerves of the brain, if the patient is brought under observation very speedily after the commencement of the attack, the abstraction of blood, either by venesection, or locally by leeches, to a moderate extent, will usually be found advantageous. But the bleeding in such cases can not be carried to the same extent as in those that have been caused by active determination of blood.

It will seldom be admissible in these cases to take more than from ten to fifteen ounces of blood by venesection, or to apply at one time more than from six to eight good leeches. The whole object of the bleeding in these cases is to give a temporary moderate degree of relief to the vascular fullness, for the purpose of gaining time to obtain the action of such agents as may be necessary to re-establish, on the one hand, vaso-motor activity, and on the other hand to directly retard the morbid excitability of the cerebral structures. But experience has demonstrated that when there is present sufficient positive accumulation of blood to overwhelm the cerebral functions, and produce ordinary symptoms of apoplexy, even in this class of cases, the abstraction of a few ounces of blood sufficient to diminish that fullness, will enable the other remedies, especially those calculated to increase the activity of the vaso-motors in restoring the tone of the vessels, to act much more efficiently than they would without the temporary relief afforded by the loss of blood. In all these cases, you perceive, it would be a very great mistake to bleed to the same extent as in the first, and a greater mistake still to follow bleeding by the same arterial sedatives. For here, the heart's action is usually diminished in force, the tone of the vessels themselves impaired, and we would consequently follow the moderate check to the fullness, with such means as will most speedily and efficiently increase the tone of the vascular system through the vaso-motors and diminish the excitability of the cerebral structure. For these purposes, efficient doses of ergotine, addressed to the vaso-motor nervous system is perhaps the best that can be resorted to, and if the action of the heart be actually irregular, giving alternately with the doses of ergotine, moderate doses of digitalis, or its active principle, digitaline, will sometimes be found of more or less advantage. In those cases which are associated with increased cerebral excitability preceding the attack, instead of the ergotine, bromides may be conjoined with digitalis, or the combination of bromides and iodides in moderately full doses given alternately with the digitalis, will effect the double purpose of securing the sedative effect of the bromides upon the nerve excitability, sustaining cardiac or vascular tone by the digitalis, and the counter-action to some extent at least of serous exudation, by the influence of the iodides. While these remedies may be administered as speedily as they can be brought to bear in the early progress of the case, it is desirable to procure also early evacuations from the bowels; not as freely and thoroughly as in cases of active determination of blood, because it is not desirable to largely deplete in any way this class of subjects. But a moderately free movement of the bowels, warm and stimulating applications to the extremities, as by bottles of hot water or mustard sinapisms, with cold applications to the head, would be desirable. The cases most difficult to devise remedies for are such as are dependent directly upon fatty degeneration of the cerebral vessels and more or less of the cerebral substance, and sometimes connected with more or less calcareous deposit in the vessel walls, as is the case in a large proportion of apoplexies that take place in advanced life. Nearly all such cases are accompanied from the outset with either rupture of some portion of the

degenerated vessels, and sufficient extravasation of blood to form clots and very speedy fatal compression, or numerous smaller ruptures, causing hemorrhagic exudations, and it is exceedingly difficult to devise any remedial agents which are calculated to afford even the most temporary relief, or to make any impression upon the progress of the case. Consequently, nearly all such cases terminate fatally without exhibiting any marked changes from whatever treatment may have been adopted.

In some cases of merely threatened apoplexy, the symptoms, indicating a strong tendency to develop only partial attacks, may sometimes be warded off by the administration of nerve tonics, very moderate evacuations, the promotion of secretion, entire quiet to the patient, and the use of mild nourishment. But such warding off usually proves only temporary, and sooner or later is followed by a full and fatal attack. The treatment I have now suggested as applicable to the different forms of apoplexy, is as well calculated as any I have been able to devise to fulfill the first and second indications that I pointed out, namely, relief of the vascular fullness and the promotion of the re absorption of whatever exudation, whether serous or hemorrhagic, may have taken place. In those cases in which cerebral hemorrhage occurs, and it does not prove directly fatal, there is almost always only a partial recovery. After the treatment I have mentioned, the immediate pressure is relieved, consciousness returns, but the patient remains paralyzed in some part of the system, more frequently one side, constituting hemiplegia from the continued pressure of the clot that had formed from the extravasated blood: it is exceedingly slow in disintegrating, and seldom fully disappears. In such cases, after the active symptoms have passed by and the patient has made the partial recovery to which I have just alluded, perhaps the management which will be most likely to effect further disintegration and absorption of the hemorrhagic clot, and preserve the cerebral substance with which it is in contact from undergoing degenerative changes, will be the use of a mild, simple diet, consisting mostly of milk, farinaceous articles, with but little meat, yet sufficient in quantity to afford a fair degree of general nutrition; careful abstinence from any undue physical or mental exercise, and the use, for a considerable period of time, of moderate doses of the iodide of potassium alone, or if there be undue cardiac irritability indicated by a quick, irritable and rather compressible pulse, digitalis will make a valuable addition to the iodide.

If the patient is restless, especially, not inclined to get a fair degree of sleep at night, this may be best obviated in most cases, by giving a single, moderately full dose of the bromide of ammonium or of potassium near bed time. Sometimes it will add to the efficacy of this, if it is given in connection with as large a dose of hyoscyamus or belladonna, as will be borne without drying the mouth and fauces or altering the pupil of the eye. It is desirable as far as possible to avoid opiates, not only because they tend to increase the fullness of the cerebral vessels, but they also tend to impair the patient's appetite and constipate the bowels, as well as to lessen secretory action generally. In most of the cases now under consideration, the bowels are almost always habitually inclined to constipation. It is necessary to devise means to obviate this and maintain as healthy a regularity as possible; for by so doing, you will do much to guard against a renewal of the cerebral attacks. In many of this class, the bowels can be best regulated by giving a pill every evening, composed of six centigrammes (gr. i) each, of the extract of hyoscyamus, sulphate of iron, aloes and blue mass, with two centigrammes (gr. $\frac{1}{3}$) of the extract of nux vomica added to each pill. In a majority of patients,

one pill containing these ingredients given regularly at night, will establish a natural, healthy evacuation the following day. Where the subjects are advanced in life, and affected by more or less of the degenerative changes, all depressing agents, such as iodide of potassium alterants of any kind or evacuants, except such as are calculated to keep the digestive organs in good order, are to be avoided. A mild, unstimulating but nutritious diet as far as practicable, good air, passive exercise by riding, and sometimes mild tonics will be required to give this class of patients the most comfort, and the longest duration of life. In the treatment of the convalescing stage of all cases of apoplexy, it is necessary to take great care for several days, and sometimes weeks, to avoid every kind of mental and physical excitement or exertion. Quiet is of great value. I know of no class of patients predisposed to apoplexy, or recovering from a direct attack in which any form of diffusible stimulants are of value. A very moderate use of tea and coffee may be allowed more especially to the aged; where there is no direct increased cardiac force or irritability, tea and coffee used moderately, will seldom produce unpleasant effects. But the alcoholic class of agents, whether fermented or distilled, are directly and positively objectionable, both on account of their tendency to produce deficient oxygenation and decarbonization of the blood and favor fatty degenerations, and also on account of their direct anæsthetic effect upon the sensibility of the cerebral substance, and upon vaso-motor nerve influence.

I have met with a few patients a little past the middle period of life, two of whom live still under my observation, who have repeatedly manifested symptoms indicating imminent danger of full apoplectic attacks. One of these is a female, about forty-five years of age, who during the last six years has been habitually inclined to deficient urinary secretion, but without evidence of any structural disease of the kidneys, also a moderate increase of flesh or fullness, and some degree of constipation, but no cardiac hypertrophy, and no undue fullness or tension of the pulse. Almost regularly during every year she has exhibited an increase of cerebral fullness or congestion in the vessels of the brain, until, if not interfered with, she would be seized with vertigo, dimness of vision, slight twitching of the muscles of the face, and a complete suffusion, or congestion of the vessels of the face, neck and head, causing the surface to have an almost purple color accompanied by every symptom of immediately impending apoplexy. When these attacks first made their appearance I resorted to every means that I could devise for warding off the threatened apoplectic condition, without resorting to direct abstraction of blood. Free opening of the bowels, diuretics, cold applications to the head, sinapisms to the extremities, and at first vascular sedatives were used. Failing to get benefit from these, vaso-motor excitants and full doses of ergotine were tried but all without any perceptible relief. A vein was then opened in the arm and blood drawn, to the extent, in the earlier attacks, of from half to two thirds of a liter (℥xvi to ℥xx). This was followed by relief both speedy and entirely satisfactory. And subsequently the palliating remedies addressed to an increase of the secretion of the kidneys, regulation of the bowels, and of all the functions that might be out of order, produced effects very much more ready and satisfactory than the same remedies before the abstraction of blood. I have apparently warded off these attacks in both the patients alluded to, for the last six or seven years, by the occasional abstraction of blood. During the later years not more than 260 or 360 cubic centimeters (℥viii or ℥xii) have been required to afford the needed relief. During the last five years one of these patients has

been under the care, at different times, of several other physicians, who most perseveringly endeavored to afford relief without resort to bleeding, but with no better success than I had myself. I have no doubt but that the patient would have died several years since, instead of being in such health as to be able to superintend her household affairs, as she is at present, if venesection had not been resorted to for her relief.

Another equally well marked instance is an adult male engaged in mercantile business, in which the threatened cerebral congestion was associated with very marked increased action of the heart, with no appreciable indication of valvular disease or structural changes, but an increased activity, apparently extending to the aorta and the vessels of the neck. This case, when first coming under my observation presented such symptoms as indicated, a turgid condition of the vessels of the face and a nearly suspended cerebral function, and caused no hesitation in resorting to venesection. The patient was bled to the extent of nearly one liter (℥xxx). He too had been subject for a considerable time to defective action of the kidneys, slight tendency to constipation, and had noticed some degree of vertigo. He was a man of naturally sanguine temperament, broad chest, short neck, and in his case after the prompt relief that was obtained by the free bleeding, he was put directly upon the use of a combination of bromide of lithium, wine of colchicum root and for a time the tincture of veratrum viride, and with the most decided beneficial effect. The urinary secretion became abundant, the excitability of the heart and cerebral vessels apparently returned to the natural standard, and by the continuance of full doses of this combination of remedies each night and morning for two or three months, the patient gained an exemption from this tendency to cerebral congestion, which had lasted him through at least two full years. Subsequently, when indulging more sedentary habits than usual, the symptoms returned upon him, and with such a degree of intensity as required another, but more moderate bleeding. Since that time, now four years, the resort for a few weeks at the time, two or three times a year, to the use of a combination of bromide of lithium, wine of colchicum, and tincture of digitalis, in moderate doses, at first three times a day for one week, and then morning and evening for a few weeks subsequently, has kept him from any return of symptoms sufficient to attract attention, or interfere with his usual occupation. I have mentioned these cases, and the treatment that I have given them, for the purpose of guiding you in reference to similar cases that are liable to be met with in practice, especially among patients of sedentary habits, accustomed to moderately full living, and who at the same time have much of either business or other cares and mental anxieties influencing them. Of course, in the management of all such patients, strict attention should be given to the judicious regulation of their diet and their exercise; to the condition of the digestive organs, as well as some degree of attention to the condition of the renal secretion. The latter escapes attention very frequently, when it would be very much to the advantage of the patient if it was as studiously inquired after and properly regulated, as the evacuations from the bowels, or the condition of the digestive organs, which are not nearly as likely to produce direct effects upon the brain as deficiency in the quality and quantity of the urine.

LECTURE LXX.

Paralysis—Its Varieties, Causes, Clinical History, Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: After directing your attention as much in detail as is necessary to the nature and management of the different varieties of apoplexy, I next ask your attention to a subject in some respects closely allied to it, namely paralysis. This term is made to include a group of affections differing in many respects, especially in regard to their pathological relations, causes, symptoms and consequences. The word implies, as it is generally used, impairment or loss of the natural function of nerve structure. And as the functions of the nervous system are two-fold, sensory and motor, paralysis may consist in impairment or complete loss, either of the function of sensation properly denominated anæsthesia, or of motion by which the muscles supplied with the nerves whose motor power has been lost, become inactive or incapable of normal contractions. Sensory and motor paralysis may exist together, causing a loss both of feeling or sensibility and the power of motion, or either one may exist separately without the other. Cases of paralysis are often named in reference to the immediate or proximate cause: cerebral, when the cause or pathological condition giving rise to them is located in any part of the brain or contents of the cranium; spinal paralysis, when the seat of the disease is in some portion of the spinal cord; and reflex paralysis when the primary seat of irritation is in the periphery of some one or more nerves, and the influence is reflected upon the nerve center either in the cord or brain. Some writers group their cases of paralysis not in accordance with their direct proximate cause, their location or the pathological condition giving rise to them, but in accordance with the extent and location of the parts paralyzed; as facial paralysis, when the parts affected are only some portion of the face; or if it affects a particular muscle only, the name will be indicated by the name of the muscle involved. If it affects the whole of one side, they denominate it hemiplegia. If it affects a part of both lower extremities, or the whole up to a given line transversely, it is designated paraplegia. In considering the non-inflammatory conditions capable of giving rise to paralysis, either motor or sensory, we find almost the same pathological conditions, either in the brain, medulla or spinal cord, that I have already described as giving rise to apoplexy. The chief difference is generally in the extent of the parts involved. In apoplexy, the congestion of the cerebral mass is more general, or if it depends upon hemorrhagic exudation or extravasation, the quantity of blood extravasated is sufficient not to interrupt merely the function of a portion of the brain, but of the whole. And if degeneration of vessels and cerebral structure from any cause, whether from age, from the action of alcohol, syphilis, or any other toxæmic agent acting through the blood, affects but a limited portion of the cerebro-spinal substance, instead of producing apoplectic symptoms, it will only cause suspension of the functions of the parts, sensory or motor, to which the nerves are distributed, having direct or indirect connection with the locality in which the disease exists, and consequently

will constitute paralysis instead of apoplexy. But when this condition exists in the cerebral substance, it frequently happens, as I have mentioned when speaking of the symptoms of apoplexy, that the attacks primarily present all the symptoms of the latter disease, but in the progress of recovery the greater portion of the cerebral mass becomes relieved from pressure, apoplectic symptoms disappear, but paralysis, usually in the form of hemiplegia, is left. In such patients you can maintain no line of distinction in the primary seat of disease, between apoplectic and paralytic attacks. They are identical; the paralytic condition being the result of only a partial recovery from cases presenting all the characteristics of apoplexy at their beginning. In the further consideration of the subject of paralysis, I shall direct your attention, first, to those cases which, the pathological lesion being in some part of the cerebral mass, may properly be called cerebral paralysis; second, to those originating from changes in some portion of the spinal cord, under the name of spinal paralysis, including what is denominated as infantile paralysis, reflex or indirect paralysis, and what might be termed hysterical or false paralysis.

Hemiplegia.—As the word would indicate, hemiplegia means paralysis more or less complete of one half of the body, including one upper and one lower extremity, and is the most common form of paralysis resulting from non-inflammatory affections within the cranium. Attacks of hemiplegia ordinarily commence suddenly, often without premonitory symptoms of more than a few minutes' duration. In some instances, however, there are sensations of numbness in the hands and feet, or both, occurring at short intervals, and in others vertigo, for a considerable period of time before a decided attack of paralysis supervenes. In a large majority of instances, however, complete hemiplegia arises from either emboli obstructing suddenly one or more cerebral vessels, or the rupture of some vessel, the walls of which had become more or less weakened by degeneration, and the extravasation of blood. A considerable number of cases met with in practice are simply the sequelæ of attacks of apoplexy, during which hemorrhage had taken place causing the formation of a clot, which remains after the more fluid part of the blood has been absorbed. The presence of such clot is sufficient to prevent the resumption of the complete functions of the motor influence emanating from the hemisphere into which the hemorrhage had taken place, and consequently hemiplegia remains. In all the classes of cases that are dependent either upon embolism, or upon the extravasation of blood, the primary symptoms supervene suddenly. The symptoms which more particularly characterize hemiplegia when it is complete, embracing one side of the face, neck, arm, leg and one half of the tongue, are the drooping or relaxation of the muscles of the paralyzed side of the face, which cause the mouth to be drawn to the opposite side whenever the muscles contract, giving to the face an expression of laughter. There is difficulty of moving the food in the mouth from the paralyzed condition of the buccinator muscles, and the turning of the tongue toward the paralyzed side when it is protruded, because of the action of the muscles upon one side only. There is also impaired deglutition and speech. The paralysis seldom includes the nerves supplying the eyelids, or the muscles controlling the eye-ball, consequently movements of these parts remain on the paralyzed side the same as on the other. The arm, however, hangs motionless, and when the patient is raised into the erect position, the shoulder droops, and the lower extremity fails of all power of motion. Sensibility in most instances remains nearly perfect throughout, but in some there is impairment or loss of sensibility as well as of

motion. In some cases the paralysis embraces the viscera of the pelvis, so as to paralyze one half of the rectum and bladder, giving rise either to retention of urine till the bladder is overfull, when it would dribble, and the discharge of fæces with only a very partial control on the part of the patient. When complete hemiplegia has supervened, presenting the symptoms just described suddenly, it renders the patients usually for the first week entirely helpless; and they may remain so, failing in strength, without control over the sphincters of the body, and the temperature of the extremities falling below the natural standard. The dribbling of urine and wetting of the bed, unless great care is taken to avoid it, hastens the appearance of inflammation, excoriation, and sometimes gangrene over the hips and nates or parts in contact with the bed, leading, in many instances, to deep and large bed sores; the patient loses his appetite, the mind becomes weakened, sometimes wandering, and after lingering in a very uncomfortable condition of entire helplessness from one to six weeks, death may supervene, apparently from asthenia or exhaustion.

But in a very large proportion of cases of hemiplegia, whether orignating from full apoplectic attacks or from hemorrhagic exudation, the patients, instead of failing, as I have just mentioned, slowly improve from day to day, more especially in the movement of the muscles of the face or tongue, so much so that in many the face becomes nearly even, only active muscular action showing impairment, and the movement of the tongue being entirely restored. These improvements also enable the patient to regain his usual freedom of speech and deglutition. While these improvements are taking place in the paralyzed parts of the face, tongue and neck, there is usually a manifest improvement perceptible in the ability to move the arm and the leg. At first, this consists simply of the power to slightly draw the leg up an inch or two, by bending the knee, and of making a motion of the arm more from the muscles of the shoulder, than from those on the arm proper. It is seldom that such patients suffer from any severe pain in the head, or any other part of the body, unless it is from being compelled to lie or sit too long in one position. Those that present these improvements usually recover also pretty fully the control of the bladder and rectum. They have a good appetite, and in all respects feel well, except the inability to use the upper and lower extremity. Where the improvement takes place thus far, the patient usually commences to get upon his feet, and to make efforts to walk. These efforts to use the paralyzed limb become systematic, and with the aid of a cane or a crutch, they are able to walk, by giving to the paralyzed leg a swinging or partially circular motion, bringing it forward more by the swinging of the pelvis forward, than from the regular picking up of the limb and setting it forward, as is natural in the process of walking. This mode of walking is peculiar to the partially paralyzed of a hemiplegic character. In almost all cases, where partial recovery takes place, the patient being able to be upon his feet, the recovery of the use of the leg is much greater in proportion than that of the arm and hand. As the patient feels less necessity for the daily efforts to use the paralyzed hand and arm, the other affording a ready substitute for most of his wants, they are allowed to remain more passive, and consequently are much slower in recovering, and generally recover less perfectly than does the lower extremity. If the paralysis has originated primarily from serous exudation, or only a partial plugging of the vessels by an embolus, recovery may be complete, and that in the course of from three to six weeks, by the re-absorption of

the exudative material, and the dissolution or disappearance of the embolus that had obstructed the vessels and temporarily suspended circulation in a portion of the cerebral substance. It is not always, however, that emboli are capable of removal in this way, consequently many cases dependent upon them, either make only a partial recovery or no improvement.

Those cases of hemiplegia that occur from direct extravasation of blood and the formation of fibrinous clots, very rarely progress to an entire recovery, but only make such a degree of improvement as enables the patient to walk with some difficulty and unsteadiness by bringing the leg forward at each step with a semi-rotatory motion of the pelvis, while the hand and arm remain almost entirely useless. When the disease becomes thus permanent it may remain stationary for a very variable period of time. Cases that have come under my own observation have remained apparently stationary for several years. But in all of these, sooner or later, there have been renewals of the extravasation or exudation of blood, bringing renewals of a more complete hemiplegia, until in some instances the extravasation has been sufficient to overwhelm the functions of the brain, inducing coma, universal paralysis and death. In other cases there has been no relapse in their progress, but the brain surrounding the clot has undergone a slow degenerative process, usually of the nature of an arrest of nutrition, and consequently softening of structure, correspondingly impairing more and more the strength of the patient and his ability to use either the upper or lower extremity. At the same time I have noticed a decided failure in the mental capacity, usually in the direction of simple mental weakness, impairment of memory, incoherence and steady progress toward imbecility. This slow deteriorative process in the cerebral substance surrounding the primary clot may increase gradually till at the end of two, three or four years the patient becomes quite imbecile, paying little or no heed to evacuations of urine or fæces, yet taking food freely and even ravenously whenever it is put into the mouth, but manifesting neither capacity for connected thought nor mental activity, and becoming entirely devoid of ability to maintain the upright position, either upon the feet or in the sitting posture. In this condition of helplessness and mental imbecility he may still live for a considerable period of time; but usually sinks gradually into an unconscious condition with general paralysis and dies. Such is a general statement of the symptoms and progress of the common forms of hemiplegia, resulting from non-inflammatory obstructions in some portion of the brain. Cases may be met with in which the lesion is in the brain, and yet it may not impair or paralyze the entire half of the body, but only a certain portion of one side; as when it interrupts the function only of the motor nerves of one side of the face, producing what is thus styled facial paralysis. In another instance it affects only the function of those nerves which supply the arm, rendering it incapable of motion, while the face above and the lower extremities remain unaffected. In perhaps a smaller number of cases, a single leg may be paralyzed without involving the arm or the face and yet the seat of disease may be in the brain. Ferrier, in his efforts to localize the functions of the brain, has pointed out particular parts, which, when obstructed by hemorrhagic exudation, tumors or any other mode of pressure, had given rise to movements in particular parts of the body. He claimed to have established the fact that when one leg was paralyzed the seat of disease was in that part of the cerebral mass above the corpus-callosum of the side opposite to the leg paralyzed. In paralysis of the upper extremity, the seat of disease was somewhat

anterior, and connected with the anterior lobe of the brain, or near its junction with the middle lobe. While in paralysis of the face, muscles of the tongue, and especially in aphasia or that form of paralysis destroying the ability to speak, the seat of disease was said to be located in the convolutions on the inner side of the anterior lobe, opposite to the parts paralyzed. These views of Ferrier have many facts to confirm them, and yet they require a much larger collection of pathological facts and results of recorded cases to establish their absolute correctness.

Anatomical Changes.—When death takes place from hemiplegia, and a post-mortem examination is had, the anatomical changes found in the brain, differ in different cases, and with differences in the length of time that the disease had existed before the death. In those cases that supervene suddenly producing complete hemiplegia proceeding to a fatal result early, there will usually be found simply a rupture of one or more blood vessels, and the extravasation of blood, the serous portion of which may have been partially absorbed, but a fibrinous clot is left. In most instances, close examination will show that the extravasation has been the result of fatty degeneration of the coats of the ruptured vessels, or some other form of structural impairment. It is very rarely that such rupture has taken place, unless from direct violence, without proceeding from conditions impairing the structure of the vessels themselves. In some instances, examination has shown the origin of the disease to have been in the plugging of one or more vessels by emboli, or fibrinous clots. In such cases the portion of the brain supplied by the vessels thus plugged will exhibit deficiency in the supply of blood, provided the vessel is an artery. If it be a vein, the capillaries and smaller arteries connected with the distribution of the vein may be intensely engorged, or even exhibit serous or sanguineous exudation into its texture. In some instances, the paralysis or hemiplegia has been found dependent on the formation of one or more tumors, which had developed either in the cerebral substance or in the membrane covering it. The most common form of morbid growth is sarcomatous enlargement of the glands lying along the longitudinal sinus, or in the vicinity of it, more frequently than elsewhere. Sometimes tumors originating in the membranes of the brain attain considerable size, developing slowly, and the cranium being incapable of yielding, the tumor becomes imbedded deeper and deeper into the cerebral substance, producing a variety of symptoms during its progress that vary from simple severe attacks of pain, and temporary spasmodic twitching of muscles, up to that of complete paralysis, and often coma followed by death. Of course you will keep in mind that I am now speaking only of paralysis arising from non-inflammatory affections of the brain. I have already had occasion to point out the occurrence of paralysis in all its degrees of development as the result of inflammation and effusions, when speaking of the inflammation of the central portion of the nervous centers. Our present purpose, however, is simply the consideration of those of a non-inflammatory character.

LECTURE LXXI.

Hemiplegia continued—Its Diagnosis, Prognosis and Treatment; Paraplegia; Paralysis from Lead and Mercury, and Paralysis Agitans.

GENTLEMEN: The diagnosis of hemiplegia, either partial or complete, so far as relates to the existence of the paralysis is not difficult. The characteristic phenomena are mainly objective and easily recognized. The only difficulty consists, not in deciding whether paralysis actually exists, but what is the nature and location of the pathological condition on which the paralysis depends? Whether the conditions are located within the cranium, and have resulted from inflammation, capillary congestion, hyperæmia from cardiac hypertrophy, degenerative changes in the blood vessels, emboli, or mere reflex irritation, is not in every case easy to determine.

To distinguish these cases from paralysis depending on inflammation, you have only to remember that the latter have a history showing all the phenomena or symptoms usually produced by acute or sub-acute inflammations of important structures, such as pain, fever, or intensity of excitement for a longer or shorter period previous to the occurrence of the paralysis; while in the conditions of a non-inflammatory character, whether the onset be sudden or gradual, it is accompanied by no fever, or perceptible rise of temperature, or any one of the assemblage of symptoms which indicate active inflammation. To differentiate hemiplegic paralysis dependent on the cerebral lesion from those of a mere reflex character, which are liable to occur chiefly in hysterical, choreic, and epileptic patients, and by some supposed to be capable of arising from reflex irritation of worms and other disturbing influences in the alimentary canal, you have only to inquire carefully into the history of the patient's case. Such history will readily show whether there has been the existence of hysterical, choreic or epileptic paroxysms, and the connection of the paralysis with the supervention of the paroxysms of any one of these affections. It may be proper to remark, however, that in addition to a history showing prior existence of some one of the nervous affections named, a hemiplegia, arising from or in connection with these diseases, is seldom complete. More generally it is only partial and passes away in a few days after a paroxysm of the affection on which it depends.

Prognosis.—From the nature of the pathological changes I have mentioned as giving rise to hemiplegia, you will infer that the prognosis, so far as relates to complete restoration, is very unfavorable. But few of these cases are in danger of immediate death on the supervention of hemiplegia, while there is still less prospect that any considerable number will make a complete recovery. A majority recover partially, but linger for months and sometimes years, in an impaired condition so far as locomotion and control of muscular action is concerned, and they gradually decline from further degenerative changes in the brain, till the final termination of the life. Consequently, while there is but little danger of immediate fatal results in attacks of hemiplegia, there is no reasonable prospect in a majority of cases, of reaching an entire recovery. And, if recovery is not reached, in process of time there occurs more or less softening or disintegration from degenerative changes in the portion of the brain affected, constituting a species of impairment of texture, and con-

sequently of function, to such an extent as to terminate the life of the patient.

Treatment.—The treatment in hemiplegia is in all respects similar to that of apoplexy, except there is very rarely any indication for the abstraction of blood by venesection. In a paralytic affection having originated from the establishment of some direct pressure upon the cerebral substance, such as the formation of a clot or embolus or presence of a tumor, the abstraction of blood could have but little effect in altering the circulation in the obstructed vessels of the brain. The leading indication for treatment when these cases come into the hands of the physician, are, on the one hand, to favor as much as possible, the removal by absorption, of whatever material may be producing the paralyzing pressure upon the cerebral structure, and on the other to prevent further deterioration or impairment of structure in the vessels and cerebral substance constituting the seat of the disease, and thereby lessen the danger of renewed extravasations or the increase of degenerations and morbid growth. There are no better remedies for the accomplishment of these different purposes than those which I have pointed out to you in a previous lecture when speaking of the treatment of the different stages of apoplexy, more particularly of those cases that depend upon either serous or sanguineous exudation, and those which result from degeneration and consequent passive accumulation of blood in the vessels of the part, consequently it would be a needless repetition to state these remedies again at this time. So far as paralytic symptoms are found associated with epilepsy, chorea and hysteria, they will be noted with more advantage when I call your attention especially to those affections. The paralysis following diphtheria, sometimes called diphtheritic paralysis, was considered with a sufficient degree of fullness when speaking of the sequelæ of that disease in the earlier part of the present course. The same remark is applicable to those cases of partial or complete hemiplegia, dependent upon syphilitic diseases of the membranes covering the brain; they having been sufficiently considered when speaking to you of constitutional syphilis in the class of general diseases.

Paraplegia.—This is an affection characterized by loss of motion, usually in both lower extremities, up to a given transverse line. That line may be at any point between the ankles and the armpits. A large majority of cases of paraplegia, however, consist in paralysis of the lower extremities from the hips down. The paralysis may involve complete loss of motion, rendering both lower limbs entirely helpless and motionless, or it may be only partial, rendering the movements so weak that the patient is unable to walk or even to maintain an erect position upon his feet. In very few cases is paraplegia accompanied by loss of sensation coincidently with that of motion, but sometimes this is the case, and in some very rare instances sensation alone is lost while motor power remains. Nearly all the cases of paraplegia depend upon inflammation, and its consequences, particularly in the development of sclerosis and other morbid conditions of the spinal cord. But some cases are liable to be met with by every practitioner, arising from pathological conditions in some portion of the spinal cord, of the same nature with those that have been described as taking place in the brain, namely hemorrhagic extravasations, either upon the surface or into the texture of the cord, emboli plugging some of the vessels, or the development of tumors, or more frequently thickening and induration of the membrane surrounding the cord, and occasionally there may be disease of the bones producing sufficient curvature to compress the cord and thus paralyze the parts below. The pathological conditions in the spinal cord giving rise to paraplegia, are the

same in kind as those which give rise to hemiplegia when located in the brain. The same principles of treatment apply, as well as the same rules for diagnosis, as has been already stated in speaking of hemiplegia. These affections of the spinal cord are, however, much more rare than the corresponding morbid conditions taking place in the brain; and hence, as I have before remarked, much the larger number of cases of paraplegic diseases are dependent upon some grade of inflammatory action, inducing some degree, either of sclerosis or effusion, and consequent atrophy of nerve substance in the cord. Such is the case with what is denominated infantile paralysis, which usually attacks infants or children between the ages of six months and five or six years. Most such cases occur suddenly and involve sometimes one, but more frequently both lower limbs at the same time. In many the inflammatory condition yields under appropriate management and the paralysis disappears. In others, however, the inflammatory process results in exudation, and ultimate atrophy of the nerve structures, more particularly those which regulate the supply of blood, consequently causing an arrest of the growth of the parts paralyzed, and leading ultimately to permanent shortening of the limb or limbs and to a size much less in proportion than the rest of the body.

These cases, however, are so generally dependent on congestion or inflammatory action, that their management was sufficiently indicated when lecturing upon the different grades of inflammation, and sclerosis of the spinal cord.

Progressive locomotor ataxia, progressive muscular atrophy, were also included among the diseases of an inflammatory character, consequently the only forms of paralysis remaining to which I will ask your attention, are those arising from the effects of lead, called *lead palsy*, those arising from mercurial preparations, and some cases of *paralysis agitans or shaking palsy*.

Paralysis arising from the introduction of carbonate of lead into the system usually comes on gradually, and in a majority of instances is felt first in the muscles of the fore-arm, more particularly the extensor muscles on the back of the fore-arm, that extend the hand, while the flexors upon the front of the arm remain unaffected. This renders the patient incapable of lifting the hands backward, and causes them to droop or hang down, giving to the disease the name of *wrist-drop*. While the muscles of the fore-arm are in most cases the first to show the paralyzed condition, the disease may attack almost any of the muscles of the body, either voluntary or involuntary. But it is often manifested in the muscular coat of the intestines, arresting intestinal evacuations and producing that most obstinate and painful affection of the bowels, denominated *lead colic*. The symptoms which accompany lead palsy, in addition to the peculiar impairment of the muscles of the fore-arm, and perhaps the arrest of peristaltic motion in the intestines, are a general paleness or anæmic hue of the patient, a rather dejected and saddened expression of countenance, feelings of lassitude, indisposition to exertion, and more particularly a blue line along the edges of the gums surrounding the teeth. This blue line usually occupies the thin edge of the gum surrounding the neck of the tooth. It is shown pretty generally in the gums of both upper and lower jaws, whenever the system is sufficiently affected to materially interfere with muscular action in the extremities or in the intestines. Besides the usual constipation of the bowels, general weakness of the muscles and the special loss of power in those of the fore-arm, most of the patients have impaired appetite, restlessness at night, and scantiness of

urine. But the paralysis and constipation, with colic pains and the blue line at the edge of the gums, are the most reliable diagnostic symptoms. If the accumulation of lead in the system is allowed to continue and the patient to go without appropriate treatment, the impairment of muscular action may continue to increase till the patient becomes helpless, while the obstructed condition of the bowels leads to entire suspension of digestion, with frequent turns of nausea and vomiting, accompanied by rapid emaciation, until complete asthenia and death result, after a period of suffering varying from one to eight or ten years. Cases have occurred in which the lead poison affected the brain and its membranes, producing obscure cerebral symptoms, ending finally in entire unconsciousness or coma and death. The cerebral affection, however, is rare; the great majority of patients retaining their mental faculties throughout the whole course of the disease. While lead poisoning is often capable of destroying life, yet if the further introduction of the mineral into the system is avoided, and the patient placed in favorable circumstances, the general rule is that it is slowly eliminated even without the aid of remedies. But the elimination may be hastened by treatment till the system becomes entirely free, and the patient restored to a fair degree of health.

Prognosis.—The prognosis, therefore, is, in most cases of lead poisoning, favorable.

The great majority of patients who become affected with this disease receive the lead by absorption through the cutaneous surface and through inhalation of the fine dust as it is floating in the atmosphere of the room in which they work. A great majority of these have become affected by the continuous use of white lead or carbonate of lead, particularly while working in doors, and those most exposed to this poison are employed in the manufacture of white lead. Another not very infrequent source of poisoning with lead is the use of cosmetics containing this mineral by females, under the erroneous idea of improving their complexion. I have met with a considerable number of cases, in young and middle-aged women who had not only produced a troublesome series of symptoms, consisting of deranged digestion and general impairment of the blood and nutritive processes, but had established well-marked paralysis of the extensor muscles of the forearm, rendering them incapable of raising their hands to their heads or of doing any ordinary work. The effects were induced by the almost daily use of powders containing carbonate of lead applied pretty freely to the surface of the face and exposed parts of the neck.

Treatment.—The first object to be attained in the treatment of such cases is the removal of the patient entirely from the further operation of the exciting cause. All handling of the carbonate of lead, or any preparation of lead capable of assuming the form of a carbonate, must be discontinued, whether in manufacturing, painting, or in using it as a cosmetic. And where none of these things have been the cause, it may be found that the patient has received his supply from water drained through lead pipes. If so this must be sought out and carefully avoided. The remedies which have succeeded best in my hands in hastening the elimination of the poison and thereby removing its effects, whether in the muscular coats of the intestines or in the voluntary muscles of the arm or other parts, has been the use of the iodide of potassium in moderate doses, but persistently, for a considerable length of time. When the case has involved much pain, as in lead colic, I have found it beneficial to combine with the iodide, conium or hyoscyamus, in such doses as would be borne without producing dryness of the mouth, or affecting the pupil of the eye. Opiates are to be avoided, as far as possible, on account of

their increasing constipation and impairing, more or less, general secretory action. In a great majority of cases, from three to five decigrammes (gr. v to viii) of iodide of potassium given in solution three or four times in the twenty-four hours, and accompanied, when there is much pain or restlessness, by suitable doses of either conium or hyoscyamus, will be sufficient to produce marked improvement during the first week after commencing treatment. But to render the improvement permanent, it is often necessary to keep the patient under the use of the same remedies to the extent of from two to four doses in the twenty-four hours from three to six weeks. In the meantime the diet should be simple, easily digested, but sufficient to nourish the patient well; and as far as possible allow him to have good, pure air, and more or less passive outdoor exercise. But all severe exertion, both physical and mental, should be avoided when possible.

Paralysis supposed to arise from mercurial preparations is much more rare, and generally only partial, consisting rather of paresis or impairment of muscular power, with more or less trembling and unsteadiness of action. It is to be relieved by avoiding all further introduction of the poison which has produced the disease, placing the patient at rest in good hygienic condition, and the moderate use of the iodide of potassium internally. After the elimination of the poison, if there is remaining much debility, tonics and a more nutritious diet, and, at least, free passive exercise in the open air, will usually render recovery complete. A large portion of the cases denominated *paralysis agitans* or trembling paralysis depend upon sclerosis, or what has been called disseminated sclerosis in the upper portion of the spinal cord and medulla oblongata, and have already been considered under the head of inflammatory affections of the cord. Some of these cases, however, appear to be dependent upon simple paresis or impairment of the functions of the cord, and are associated with general weakness, or more frequently with the general deteriorations of old age. Indeed, the affection is restricted mostly to persons, whether male or female, in advanced life. The treatment, when dependent thus upon the deteriorations of age, or debility, must be simply palliative and supporting. Relieving the patient of mental anxiety as far as possible, allowing much rest in the recumbent position with short periods of passive exercise, by riding in the open air whenever the atmospheric conditions are favorable, and such mild tonics and nutrients as the condition of the system may indicate in each case, constitute the best treatment. No remedies have been found to exert a very satisfactory or reliable control, directly as remedies addressed to the nervous system, in diminishing the trembling of the muscles whenever motion is attempted. In many of these cases the trembling continues when the patient is entirely at rest, but in the greater number of instances it ceases during sleep. But, while no remedies have been found reliable, or satisfactory in their influence, several have been found to mitigate or lessen the degree of trembling and thereby to afford more or less comfort to the patient. Moderate doses of cannabis indica, mono-bromonated camphor, chloral hydrate, and different preparations of valerian, are perhaps among the best for palliative purposes.

Having thus reviewed the forms of paralysis, depending upon non-inflammatory conditions, and not connected, as sequelæ, with general acute diseases, we will next call your attention to the consideration of epilepsy.

LECTURE LXXII.

Epilepsy—Its Varieties, Causes, Clinical History, Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The morbid conditions giving rise to the phenomena of epilepsy, are among the most important of the functional diseases of the nervous system. They may be met with at any period of life, although they commence much more frequently in childhood and youth, than during adult life or in old age. They occur also in both sexes, but of those cases originating between fourteen and twenty years, perhaps a larger proportion occur among females than among males. A considerable number of cases of epilepsy have their beginning during infancy, being manifested by the occasional sudden occurrence of convulsions, from which the little ones quickly recover, leaving little apparent impairment, and which, at the time, are considered to be ordinary convulsions arising from teething, or from supposed irritants in the alimentary canal. Their epileptic character in many cases is not suspected until their re-occurrence at a latter period of the child's growth. The disease is manifested in various degrees of severity, from a slight momentary interruption of consciousness, accompanied by sudden rolling of the eyes upwards, with a slight tremulous or irregular motion of the eye-balls, to that of a full, general, clonic spasm or convulsion. In some instances the disease manifests itself only in these slight momentary interruptions of the consciousness of the patient, not lasting long enough to produce a fall before they resume their consciousness, and oftentimes proceed directly with what they were doing before, as though no interruption had taken place. Children at play with their comrades will thus be taken, momentarily interrupting their play and allowing them to resume it again before they had hardly attracted the attention of those with whom they were engaged. These slight symptoms may occur only at intervals of several days, or they may occur several times during the same day. But most patients who become subject to these frequent slight turns, at longer intervals varying in the early stage of the disease from one to six or eight months, will have a full epileptic paroxysm, called by them a general convulsion or fit. There are others that seldom have these slight turns, but are subject only to the recurrence of the general paroxysms, at first, after long intervals, and then gradually with more frequency in proportion to the time of its continuance. Another mode of manifestation with many epileptics, is the occurrence at irregular intervals of a certain degree of vertigo, differing from ordinary vertigo, in being accompanied by some peculiar sensations originating pretty uniformly in a portion of the cutaneous surface, either upon the trunk of the body or upon one of the extremities, and apparently moving from its point of origin toward the head, and as it advances high enough to reach the neck or throat, there succeeds a peculiar sensation in the head as of an inclination to turn or fall in a given direction. In many instances, they will neither turn nor fall, but after the sensation has been experienced for a few seconds, it passes away with the original morbid feeling upon the surface, and they proceed with their ordinary train of thought or work as though nothing had happened.

In another class of patients, I have observed that the first symptoms of which they complain as the direct precursor of an attack or convulsive

paroxysm is a choking sensation in the throat, a sensation as though something was rising in the throat, producing a choking and a disposition to swallow, and at the same moment of time a certain degree of giddiness or swimming in the head. The choking and giddiness both subside often without entirely suspending the consciousness of the individual, or provoking any spasmodic manifestations; but at longer intervals these same phenomena are followed by entire unconsciousness, and more or less of general spasmodic action. I have mentioned these different modes of manifestation of the disease, because they are often noticed in children for a considerable period before the full development of the disease, as indicated by the occurrence of a general convulsive paroxysm. And if they were duly recognized and understood, it would give the family and physician opportunity to commence treatment much earlier and with better prospect of success than when they are overlooked and neglected till the disease is more fully developed. From what I have already stated, you will infer that the active manifestations of disease are not continuous in the epileptic, but occur strictly in paroxysms. While they are paroxysmal, however, there is no near approach to regularity in the periods of time at which the paroxysms come on in a large majority of the cases; neither is there any particular time in the twenty-four hours that the disease manifests itself with any uniformity, yet, judging from my own observation, I would regard it as correct to state that at least two-thirds of all the cases of epilepsy manifest their severe and full paroxysms, especially during the first two or three years progress, in the night time or early in the morning. In some cases the paroxysm is most apt to occur after the first hour of sound sleep, in the early part of the night. But in a much larger number, the convulsive paroxysm makes its appearance in the last part of the night or on first rising in the morning. Another law, which seems to be a pretty uniform one, is that when the disease has once commenced, if it is not interfered with by treatment, there is tendency to shorten the interval between the recurrence of the paroxysms, with increasing ratio, the longer the disease continues. Hence, you will often meet with cases in which, in the early stage of the disease, the patient had but one or two paroxysms in a year, leaving an interval of six, and sometimes eight or even ten months between their recurrence, with hardly a perceptible minor symptom of any kind in the intervals. But at the end of five or six years they will be recurring in full paroxysms every month, and sometimes two or three times a month, with the minor indications, such as momentary suspension of consciousness, or spasmodic motion of the eyeballs, eyelids, or momentary turns of vertigo, and choking sensations in the neck almost every day. The disease thus continues, manifesting its active paroxysms more and more frequently, and at the same time producing more decided deteriorative effects upon the mental manifestations of the patient, as well as upon his physical movements.

Symptoms.—In describing more minutely the symptoms accompanying cases of epileptic disease, I may remark, that there is no uniform temperament, or physical conformation which belongs to the epileptic patient. But the disease may be met with in temperaments of the most diverse character. Some patients suffering from this disease will have short necks, broad chests, an active, sanguine temperament, and exhibit all the marks of good nutrition, and a good degree of physical strength and hardihood. Others will exhibit a pale, anæmic hue of the surface, spare muscles and limbs, narrow chest, long necks, and the very opposite of the sanguine, or bilious temperament, the nervous and anæmic. And I think it not incorrect to say, that you will find almost every gradation of difference between

these two extremes. The phenomena of the disease may be considered under two divisions: one belonging to the patient between the paroxysms and the other the symptoms that accompany the full active paroxysm itself. In the early stage of the disease, which may be said to cover a period varying with different patients from six to eighteen months, there are often no symptoms in the interval between the general paroxysms, indicative of any morbid condition whatever. In others, however, there is during this early period, in the interval between the full paroxysms, an unusually excitable condition of the patient, especially in reference to the excitement of the more violent passions. If in childhood, they are often regarded as passionate, ill-tempered, difficult to govern, and often more or less disturbed with dreams and startings during the night. As a rule, the appetite is stronger than in good health, especially the appetite for some of the more rich and nutritious articles of food. Sometimes this exists to such an extent as to merit the name of voracious appetite. The evacuations from the bowels are seldom different from that of health, unless there be in some cases moderate constipation. The urinary secretion is usually normal in quantity and quality. After the disease has existed for a long period of time, there will almost always be in the intervals between the full paroxysm more or less of a sudden supervention of momentary loss of consciousness, or periods of giddiness, and feelings described as *aura*, creeping sensations over some portion of the surface, and a sense of choking in the neck; but very variable in the frequency of their occurrence, and in the time of day that they may be noticeable. The symptoms which characterize a direct, fair paroxysm of epilepsy, though varying much in severity and the duration of the paroxysms, are nevertheless sufficiently uniform in their essential characters to be easily understood. The onset is generally sudden, sometimes without any premonitory sensations. The first noticeable feature will be, if the patient is awake and within observation, a sudden arrest of all motion, except in the face and head; the latter is thrown a little back and the face upward with a jerking, irregular motion, and usually slight twitching of some of the muscles of the face, and in a second or two, the jerking extends throughout the whole voluntary system of muscles, causing all the phenomena of general spasms or clonic convulsion, arresting respiratory movements, causing the face to become extremely turgid with blood, the jaws alternately clinched and open, not infrequently allowing the tongue to be caught between the teeth and bitten; sometimes also folds of the inside of the cheeks and lips, lacerating them sufficiently to cause more or less of a flow of blood with the frothy saliva from the mouth. When the convulsion has held the respiratory movements in check long enough to cause the face and lips to become purple and swollen, and the pupils a little dilated, the accumulated carbonic acid gas in the blood, and absence of oxygen, overwhelms the sensibility of the nervous system to such a degree as to arrest the further spasmodic action; then the muscles pretty rapidly relax, the patient begins to catch his breath, at first with a loud rattling noise, from the sudden forcing of the air through the mouth and throat which contains more or less viscid mucus, and as the air is forced suddenly in and out, an abundance of frothy saliva, often tinged with blood from the bitten places in the tongue and cheeks, is expelled from the mouth, which with the rattling noise, adds much to the feelings of terror created in the bystanders. But in two or three minutes the patient has gained sufficient regularity in breathing to again oxygenate and decarbonize the blood; the turgid, or dark purple hue of the face recedes rapidly, and gives place to a more natural color, and in the space of three to five minutes, or less,

the patient has passed into a condition in all respects resembling profound sleep. The breathing is nearly regular, color of the face natural, and all the muscles relaxed.

If the patient is undisturbed, in a majority of instances this apparent sleep will continue a period of time varying from fifteen minutes to one or two hours, when he will spontaneously awake entirely conscious, but with a look of surprise as though for a moment not aware of where he was or what had happened. But he almost immediately recognizes his position, and if not interfered with, gets up at once, takes up whatever he had dropped at the time the convulsion seized him and goes about his ordinary previous work, whatever it might have been. All of these patients thus have a period of quiet and apparent sleep following immediately a full convulsion. Most of them can be aroused out of this sleep at a much earlier period by shaking them, dashing a little water upon the face, and friends will almost always do this from anxiety to bring them to consciousness. It is better, however, to allow them to remain entirely at rest until they awake spontaneously, so far as the wellfare of the patient is concerned. While many patients are thus seized with fits suddenly without any premonition, there are many others, who as uniformly have certain premonitory feelings that warn them regularly of the approach of the paroxysms. The most common of these premonitory symptoms are sensations of a somewhat peculiar character, generally described as *aura*. It is a creeping sensation, not distinctly cold perhaps, but such that the patient, after feeling it once or twice, recognizes fully its meaning. It may begin at any part of the cutaneous surface, more generally either upon some part of the arm or leg, and frequently in the epigastric region. But wherever it may commence, the movement of the sensation is at a pretty uniform rate directly upward toward the neck and head. And it is usually not more than two or three minutes, and sometimes not as many seconds, from the commencement of the sensation before it has reached the neck and there uniformly produces a choking feeling, immediately followed by an arrest of consciousness. With the commencement of the jerking convulsive motions that I have already described, if the patient is in the standing position or sitting, he immediately falls prostrate, wherever he may be, and not infrequently suffers much harm from injuries produced by falling on hot bodies, or upon hard substances, and if grown to maturity, sometimes falling from stairs, windows, or other high places, producing the most disastrous consequences. But the same phenomena take place if the paroxysms approach while the patient is in bed and in profound sleep. This peculiar sensation commencing upon some portion of the surface and proceeding in a regular line toward the neck and head, is denominated in the books, epileptic aura. There are other cases, which instead of commencing with the aura upon the surface, will pretty uniformly have a distressed feeling of fullness, like gaseous distension of the stomach, or a positive pain in the epigastrium. This pain, commencing in the epigastrium, extends like compression or tightness up through the chest as though it would stop the respiratory and circulatory movements, but quickly, on reaching the upper part of the chest and neck, is superseded by sudden loss of consciousness and the development of the spasmodic phenomena of a paroxysm. In whatever way a full paroxysm of epilepsy commences, whether with or without premonition, there is perhaps with great uniformity a loss of sensation or the suspension of consciousness, with more or less general spasmodic action throughout the muscular system.

With this general cessation of the consciousness of the patient, the

time, from that moment till waking after the paroxysm has ceased, remains an entire blank, the patient having no recollection or consciousness of anything that transpired, or even of his existence during the intervening period of time. Another characteristic that is pretty uniform, is the suddenness with which consciousness returns after the paroxysm has ceased. In most other morbid conditions of the brain and nervous centers, accompanied by unconsciousness, the recovery from the unconsciousness is more or less slow and oftentimes imperfect. But with the epileptic, on the cessation of the paroxysm, he is seldom awake or aroused to any recognition of anything more than a few seconds, before this consciousness is apparently as complete as in health. There is apt to remain, however, more or less of a feeling of discomfort and strangeness through the head for several hours after the occurrence of a full attack. In many there is a dull, heavy pain in the head for the greater part of twenty-four hours. It will, also, often happen not only that there is dull headache with pressure and dizziness following the paroxysms, but an increased dullness of mental operations and inability to remember well, for two or three days after each paroxysm. This is generally not the case until the disease has advanced far enough to begin to alter, more or less, the nutritive function in the nervous centers. While such are the characteristic symptoms of the paroxysm, and the general phenomena the patient exhibits during the intervals from one paroxysm to the next, in the larger proportion of cases of epilepsy that have their beginning in childhood, the paroxysms not only tend steadily to recur more frequently, but the disease is accompanied by very gradual impairment in the nutrition, and consequently in the manifestation of the functions of the brain. So true is this, that very few individuals who commence the disease in early childhood and continue with it gradually increasing in the frequency of its paroxysms till they have passed the period of puberty, escape having the mental faculties decidedly impaired. In most cases, memory becomes unreliable, the appetite and passions of the patient fickle or variable, and sometimes altogether uncontrollable. Their sleep is more or less disturbed, appetite for food voracious, intellectual operations slow and often subject to interruption giving a noticeable disconnectedness to their expressions, while their passions and emotions become much more prominent and more easily excited to violence. As the disease progresses still further, each year adds to their mental impairment and loss of self-control, until in many instances, before they have arrived at adult life, they become apparently demented, with a peculiar expression of countenance, usually drooping at the angles of the mouth, allowing much of the time the saliva to flow out uncontrolled. At length there come also impairments in the power of speech and of deglutition, requiring care to avoid choking in taking food, and ultimately a condition of entire imbecility and helplessness, in which the patients pay little or no heed to the evacuations either of urine or fæces, and retain not sufficient mental capacity to feed themselves or to exercise the least care over their most necessary daily needs and habits. In cases where epilepsy has commenced in infancy and the paroxysms have become frequent from that time up to five, six or eight years, they are very liable to be accompanied by partial arrest in the growth of the brain, causing the brain, anteriorly at least, to be narrow, and the whole head to be below the normal size of development proportionate to their age. Where this is the case, it is almost always accompanied by a corresponding enfeeblement of mind or entire imbecility.

When the epilepsy commences at a later period in life or after the time of puberty, it is seldom accompanied in its progress by such

alterations in nutrition, and in mental manifestations as we have just described. Yet, even in such cases, it may induce much weakness and the paroxysms come so often as to destroy the usefulness of the patient altogether in any pursuit of life, and to impair somewhat the memory and the control of the reasoning faculties over the passions. Still it is rare that it reduces them to that state of imbecility which very frequently results when the disease has commenced in infancy and its paroxysms become frequent in recurrence through early childhood. There are some instances where the disease has commenced its first manifestations at or after puberty, in which the patient seldom manifests a perceptible impairment of any of the mental faculties, not even after the disease has continued for twenty or thirty years.

Causes.—In the great majority of instances, no well ascertained cause or causes can be identified as having originated the disease. During infancy and early childhood, the popular mind will attribute all the earlier paroxysms either to teething, to worms in the alimentary canal, or a little later during early childhood, to intestinal irritation and indigestion. But it is very doubtful whether any of these causes are operative in a large majority of all the cases of epilepsy that occur at the early period of life. Hereditary influence undoubtedly exists in many cases, and in a large proportion of them, due inquiry would develop the fact that the parents or ancestors in some part of the family line had been subject more or less to the disease. There are some statistics which would lead to the inference, that children born of parents who have become strongly addicted to the excessive use of alcoholic drinks, are more subject to attacks of epilepsy than those born of parents not addicted to the same practices. The use of alcoholic drinks on the part of young persons and sometimes at any period of life appears to incline, or predispose to attacks of epilepsy, but only to a limited extent. In females there are a considerable number of cases that have had the beginning of their occurrence with the period of the first manifestation of menstruation, the paroxysm of epilepsy coming at such time as to identify it uniformly with the menstrual flow. With some the epileptic paroxysm will immediately precede the commencement of the monthly sickness; in others it occurs during the progress of the flow but in the larger number, the attacks develop from one to three days after the cessation of the flow. When the disease occurs in connection with the monthly flow, and its paroxysms are rarely noticed to occur in the intermediate time, it is fair to presume that there is some morbid sensitiveness in the uterus or its appendages, that is increased by the determination of blood and greater fullness, as the menstrual flow approaches, until it extends a reflex influence through the spinal cord to the base of the brain, and thus develops an epileptic paroxysm. In the male it is supposed that the practice of self-abuse and excessive sexual indulgence in any mode, during the period intervening between fifteen and twenty years, is liable to constitute an exciting cause of epilepsy. I am not satisfied, however, that any cases have occurred under my own observation, in which this was the primary cause. I have no doubt, however, from observation, that where the predisposition exists and where the disease has already been established, that excessive sexual excitement of any kind has a decided influence in increasing the frequency of the paroxysms, and aggravating the disease. Another not infrequent cause of epilepsy, is injury to peripheral nerves by mechanical violence. There are many cases on record, where from injuries of various kinds, and sometimes surgical operations, a sentient nerve has been included in the cicatrix, left by the healing of a wound, in such a way as to cause a reflex influ-

ence to be extended to the nervous centers, and to be a direct exciting cause of epileptic paroxysms.

Among the most common of the injuries which result in epilepsy, are those inflicted upon the scalp, or upon the bones of the cranium. I have seen several instances where mere scalp wounds, after they had healed and appeared to be entirely well, were found to exhibit a certain degree of tenderness on pressure, and the patients became subject to paroxysms of epilepsy, and the complete removal of the cicatrix has been followed by cure of the disease. Fractures of the cranium that occur from blows or severe mechanical violence, though not displacing the whole thickness of bone sufficient to produce compression of the brain, may so far shatter the inner table of the skull as to cause a little spicula of bone to be depressed inward, in such a way as to have its point rest upon the dura mater and become a source of irritation, and to be followed by the development of epileptic paroxysms, usually of considerable severity. That the effect of the bony fragment, in irritating the membrane and surface of the brain, was the true cause of the epilepsy, would seem to be proven by the fact that when the scalp has been laid open, and the injured portion of bone removed with the trephine, the patient ceased to have any further paroxysms of epileptic disease, and in many instances recovered good health. You will see from the tenor of what I have said, that so far as the etiology of epilepsy is concerned, the causes may be divided into two classes, namely, those that affect primarily the peripheral extremity of sentient nerves, producing epileptiform disease only by reflex action upon the nervous centers, to which belong the cases that arise from uterine and ovarian irritations, intestinal disturbances, wounds, cicatrices, and fractures of the skull, and which are properly denominated reflex cases of epilepsy. The other class of causes act directly upon the cerebral hemispheres and ganglia at the base of the brain, producing primary changes there, and consequently they are not reflex but direct in the order of phenomena, the causes being such as produce some modification of the properties and functions of the cerebral substance, instead of acting upon the peripheral extremity of nerves. Following this division of causes, some writers have divided epilepsy into two groups of cases; one of which they denominate cerebral, and the other peripheral, or centric and excentric. By the first, they mean those cases which originate from primary irritation, or morbid action in the nervous centers, generally in the ganglia at the base of the brain, or in the surface of the hemispheres, or both. While by peripheral cases are meant those in which the primary point of irritation involves some sentient nerve at its extremity, as I have explained only a few moments since. It is well to keep in mind these two classes of cases, as it will aid you, both in devising rational modes of treatment for individual cases, and in judging of the prospects of amelioration or cure. As a rule, peripheral or reflex cases of epilepsy are for the most part curable, if the treatment is commenced at an early period in the progress of the disease, and judiciously continued for a considerable period of time, while in the great majority of cases of central epilepsy, or such as have their origin from direct irritation of the sentient portions of the base of the brain, and periphery of the hemispheres, the prognosis is not favorable; neither is it necessarily and uniformly unfavorable; but the number of cases of this class that recover is small, compared to the whole number that occur. And while the prognosis in cerebral epilepsy is very generally unfavorable so far as relates to the ultimate recovery of the patient, it is not unfavorable so far as relates to any immediate danger to life; for life may be

prolonged through many years, as I have previously explained, or until the patients have become imbecile, or even idiotic, from impairment of the cerebral structure, instead of being cut off by any acute disease.

LECTURE LXXIII.

Epilepsy continued ---Its Anatomical Changes, Diagnosis, Prognosis and Treatment.

GENTLEMEN: In considering the anatomical changes accompanying epileptic disease, it must be remembered that uncomplicated epilepsy seldom terminates fatally in any of the earlier stages of the disease, consequently opportunities for post-mortem examination of patients in the early periods of the progress of the disease, are afforded only by accident or through death from some other cause. When such opportunities have occurred, in most instances the changes apparent to the eye, in any part of the nervous system, are not sufficiently distinctive to indicate any special anatomical lesion as belonging to this disease. If the disease has existed for a long period of time, examinations usually show some degree of dilatation of the blood vessels in some part of the medulla oblongata, or pons varolii, and occasionally in other portions of the cerebral structure. In cases where the disease has existed for a long series of years, as in those subject to the disease from childhood to the middle and later periods of adult life, some portions of the medulla, crura-cerebri and parts of the base of the brain have been found denser than natural, the convolutions somewhat atrophied, giving to the lower part of the anterior lobes less transverse diameter than is natural. These extreme changes are usually seen only in cases which have existed from childhood, and are the result of relatively diminished growth or development, leaving the patient in a state of more or less dementia or mental imbecility. Such cases, before death, present an unusual smallness of the anterior portion of the cranium, particularly through the base and lower part of the anterior portion, while the cerebellar and occipital regions and posterior parietal parts maintain more nearly their natural size and perfection of nutrition. Notwithstanding all the investigations of the eminent neurologists of the present day, it can hardly be said that any lesion of the nervous centers, or anatomical changes have been found sufficiently constant to justify their being regarded as peculiar to, or especially characteristic of the epileptic form of disease. Such experimental physiologists as Marshall Hall, Brown-Sequard, Charcot of Paris, and not a few in our own country, have thrown much light, by their experimentations upon animals, upon what we might denominate the mechanism of epilepsy, or the different causes by which the paroxysms may be induced, and have, perhaps, pointed out more nearly and accurately the particular portions of the nervous centers that are usually involved functionally. And yet they have not arrived at a satisfactory development of any peculiar anatomical lesion. While there may be no special structural changes, however, which can not be found in connection with other manifestations of disease besides that of epilepsy, the special nature of the morbid process, which essentially constitutes the epileptic disease, may be defined to be a morbidly excitable condition of the medulla oblongata and the common

center of voluntary motion at the base of the brain, coupled with impairment of the normal control of the cerebral hemispheres over the involuntary or excito-motory functions of these central parts. The constant morbid condition belonging essentially to the pathology of the disease, is undoubtedly an undue or exaggerated excitability or susceptibility of the nervous centers of voluntary motion. This morbid excitability of the structure places it in a condition favorable for the action of any exciting cause, whether acting through the mental faculties in direct connection with the cerebral hemispheres, or by an excito-motory or reflex influence, from irritation transmitted from some morbid condition, or irritant action, at the peripheral extremity of the sentient nerves.

And if the expression of Hughlings Jackson, that the active paroxysms of the disease were the result of irregular discharges of nerve force in the cerebral centers, is meant to convey the idea that the transmission of some exaggerated impression, either through the mind or through peripheral nerves to the cerebro-spinal axis, previously in the state of morbid excitability that I have mentioned, and in consequence, carrying the motor function beyond the control of the mind or cerebral hemispheres, and thereby inducing involuntary, clonic, uncontrollable spasmodic action, together with loss of consciousness, as exhibited in epileptic paroxysms, I can assent to the explanation. While I would regard the morbid sensitiveness of the portion of the cerebro-spinal axis to which I allude as the essential and constant pathological condition constituting the epileptic disease, it is true that the coincident conditions of other functions differ widely in different patients. In one, morbidly excitable nervous centers may co-exist with a sanguine temperament, a well nourished condition of the system, full development of the muscular structures of the body, and in all respects vigorous physical health, and may produce in such epileptics, convulsions at the usual periods with as much violence as in any other class of cases with which I have come in contact. In a much larger number, however, this morbid condition of the cerebro-spinal center is associated with a condition of the physical system more especially marked as the nervous temperament, deficient rather in the performance of the assimilative and nutritive functions, leaving the blood below the normal proportion of red corpuscles, tissues generally pale or inclined to moderate emaciation and thinness of flesh. And this tendency to paleness or anæmia and diminished nutrition appear to increase slowly with the increase in the duration of the disease.

Treatment.—Epilepsy being a disease which has attracted the attention of the physician from a remote period of antiquity, and in the early ages not infrequently regarded as the manifestations of demonism, the remedies which have been brought into requisition for its treatment are perhaps more numerous and have been applied more empirically, than in the treatment of any other disease in the whole catalogue of human ailments. I shall not, however, tax your time by enumerating the long list of remedies that have been tried, recommended and abandoned in turn, but will simply give you such as the modern investigations, and my own experience in the treatment of this variety of disease lead me to regard as most important. At the time I entered upon the practice of medicine, little less than half a century since, the two leading remedies for the treatment of epilepsy were nitrate of silver and sulphate of zinc. The former, more especially, was very extensively used, and at that time it was not very uncommon to meet with cases in which it had been administered for such a length of time, and in such doses, that it had found its way through the blood to the cutaneous surface, where, acted upon by oxygen and light,

it had produced a noticeable change of color in the skin. But the most ample experience has demonstrated that the nitrate of silver, sulphate of zinc, and a long list of other agents heretofore used more or less, are altogether useless, or productive of no curative results. Since the more recent studies concerning the nature and phenomena of epilepsy has seemed to establish the fact that the disease is one primarily of morbid excitability of the nervous centers, the attention of the profession has been turned almost exclusively to the use of those agents which are properly styled nervous sedatives; such as the bromides, physostigma, digitalis, gelseminum, chloral hydrate, etc. Cases are met with in which all these remedies exercise a certain amount of influence in rendering the active paroxysms of the disease less frequent and less severe, at least for a considerable period of time; and, yet, in only a small proportion of the whole number are they found to produce any permanent interruption of the paroxysms, or to make a final cure of the disease.

Formerly, it was the habit to speak of the treatment of the disease under two divisions: one appropriate in the paroxysms, or during the period of active convulsive movements, and the other, required in the intervals, with a view of preventing the recurrence of the paroxysms. But, practically, there is no need of medical treatment or attempted medical treatment during paroxysms of epilepsy. As I have stated, when speaking of the symptoms and clinical history of the disease, the convulsive paroxysms are always temporary in their duration. Just so soon as by the arrest of respiration, the oxygenation and decarbonization of the blood is interrupted long enough, it renders that fluid sedative to the excitability of the brain, and consequently the active convulsive movements of the paroxysms seldom continue more than from two to five minutes. There is, therefore, neither time nor necessity for any active treatment of the paroxysms. Placing the patient in a recumbent or inclined position, with the clothes loosened sufficiently to prevent any undue pressure upon the chest or interference with the respiration, by opening the collar and necktie, leaving the neck, larynx and throat bare, and free access of air for the patient to breathe, constitute the only measures of any value during the active convulsive paroxysms. When the paroxysm has ceased, it should not be assumed that there is nothing to be done but simply to prescribe some favorite remedy which is supposed to exert a specific influence over the nervous excitability. This is too much the habit of a large proportion of the profession at the present day. Epileptic patients, on the contrary, need to be examined as carefully, and to be prescribed for as fully, not merely in relation to medicines to be taken, but in relation to their diet, dress, exercise and all the habits of life, as patients laboring under any other form of disease. If this attention is given them, and the treatment commenced early, while the intervals between one paroxysm and another is still long, and the measures persevered in for a number of months, a considerable proportion of cases can be cured, or at least all active phenomena of the disease suspended for a series of years. It is very important, when taking charge of any case of epilepsy, that careful inquiry be made in regard to the condition, or habitual performance of the functions connected with the digestive organs, and such measures as may be necessary should be instituted and carefully carried out for keeping the movements of the bowels as near the healthy standard as possible, neither allowing constipation on the one hand, or active purgation on the other, but such use of laxative and tonic medicines, and such articles of diet, as will promote most nearly a strictly, regular, healthy condition, both of digestion, secretion and evacuations. And in this connection

more attention also should be given to the function of the kidneys than is ordinarily done.

In some instances it will be found that the skin and kidneys are deficient in eliminating waste material, and that one needs prompting by diuretics, and the other by a warm alkaline bath twice a week, followed each time by brisk active friction with dry flannel. The exercise of this class of patients also should be regulated in such a manner as to secure a good degree of outdoor daily exercise, but without violent or protracted exertion. Mental application also should be carefully regulated, avoiding intensity of study or mental exercise in the young, or intensity of business application and anxieties in those in mature life. And yet equally, if possible, avoid leaving the mind, either of the young or middle aged, unoccupied. Both excessive mental activity, especially if accompanied with mental anxiety and depressing influences, and mental ennui or want of employment or occupancy, are unfavorable and directly calculated to increase and perpetuate the disease. Another item perhaps of quite as much importance even as a most careful selection of medicines, is the regulation of the diet. Many years since, the elder Dr. Jackson, of Boston, if I remember rightly, mentioned in some of his writings that the avoidance of meat, and adherence to a milk and farinaceous or vegetable diet was desirable and sometimes at least very beneficial in lessening the frequency of the epileptic paroxysms. Through the many years that have since passed, I have had occasion to note the influence exerted by using meat freely as an article of diet, and also by abstaining from it, in various stages, in the progress of this disease. I am fully satisfied from such observation, that in a large proportion of epileptics, all of them in fact, except those that are most anæmic, it is decidedly advantageous to have them abstain either entirely from the use of flesh meat as food, or to allow only a very limited amount at the dinner hour each day. I remember one case of well marked epilepsy, which had continued, the paroxysms gradually increasing in their frequency, for more than three years, in the person of a young man of a nervous temperament, neither strongly anæmic nor plethoric, who had been treated during much of the three years, with the usual degree of skill, so far as medicines were concerned, by a number of physicians of good standing, but without any apparent progress in ameliorating the condition of the patient, or in lessening the frequency of the paroxysms of the disease. He was tired of taking medicine, protested against its continuance, and I suggested that he at least adopt a moderate and regular daily routine of outdoor exercise, taking pains to exercise the arms and muscles of the chest, with sufficient mental occupation to furnish the mind with at least diversion and occupancy, but without any severe tax upon its activity, take no medicine and omit entirely the use of meat from his diet. He was allowed as much as his appetite required, of milk, different varieties of bread, ordinary variety of vegetables, but avoided all stimulating drinks of every kind fermented and distilled, as well as tea and coffee.

He followed the advice faithfully, and after the first four months he ceased to have any recurrence of his epileptic paroxysms, and although his future progress was noted through a period of five or six years, he continued to have good health and entire freedom from any recurrence of epileptic paroxysms. It is not the object, you will perceive, to confine patients to a low diet, in the proper sense of the word, for we allow full liberty to use what the appetite demands, and that of a sufficiently wide range or variety in its constituency; but simply exclude meat and those drinks which are known to increase the excitability of the nervous sys-

tem. There are some cases, however, of epilepsy in which the patients have already become decidedly anæmic, with cold extremities, temperature habitually one or two degrees below the natural standard of health, pulse soft, weak, and yet subject to epileptic paroxysms of more or less frequency and severity. In such, instead of prohibiting entirely the use of meat, I think it advisable simply to regulate the amount, causing them to take but a moderate proportion of the more nutritious and easily digestible varieties of meat with their breakfast and dinner, omitting it at the evening meal. In this class of subjects, wherever it can be done with sufficient degree of perseverance to render it worthy of trial, I regard the use of electricity, or rather galvanism, with some degree of friction or massage, as an important part of the treatment. The galvanic current should never be communicated to them with sufficient intensity to cause shocks or direct excitement, but in the way best calculated to promote general nutrition by its influence in quickening the functions of what are termed the trophic or vaso-motor nerves, and the inherent affinity of the primary molecules that enter into the structure of the tissues of the body. To make this available in the greatest degree, the remedy should be used from five to twenty minutes once a day, or at least every alternate day. You will note that this recommendation in reference to electricity or galvanism, with friction and massage, is only made as applicable to those cases that have become anæmic and deficient in general nutrition. For many epileptics are abundantly nourished, and eight out of ten of all of them have voracious appetites, and especially appetites for beefsteak and other items of rich food. In regard to remedial agents, none will be of much value except such as I have alluded to for regulating secretions, promoting a healthier condition of functions that may be defective, unless they be used with steadiness for a long period of time. And this is one of the greatest sources of failure in the treatment of this class of cases. The disease manifests its active phenomena only in paroxysms. In the earlier stages of their progress, they come not oftener than once in every four, six or eight months. In the intervals, much of the time, the patient has the appearance of entire good health. It is extremely difficult in such instances to have either parents, in reference to their children, or adult patients themselves realize that there is any necessity for using remedies from day to day, while apparently as well as any of those around them. All are ready enough to take medicine when the paroxysms of convulsion come, and to follow it up for a week or possibly two or three weeks after it has passed by; but to persevere in all these matters judiciously, from month to month, is what the large proportion of them will utterly fail to do, notwithstanding your most careful explanation of the nature of the disease and the necessity for such perseverance. These remarks are especially applicable to the treatment of the earlier stages of the disease. There are many cases, after they have continued five, six or a dozen years, and increased in the frequency of their paroxysms from once or twice in the year to a paroxysm every week, with visible impairment of the mental faculties, in which the anxious parents and friends will often persevere in the use of medicine until the system may be saturated even to an injurious extent. But at such advanced stage of progress, most cases of epilepsy prove to be absolutely incurable. They are often palliated and the paroxysms postponed to longer intervals between their recurrence. And, although, a great many of these confirmed cases have come under my observation, I have known but very few in which the disease has been permanently interrupted. If the disease is taken in charge in young subjects anywhere from infancy to five or six years of

age, and before structural lesions or partial arrest of nutrition in the cerebral centers has actually taken place, a considerable percentage may be cured. I speak the more positively, that a proportion of them may be cured, as I have known some long enough to know personally that the disease had remained without any recurrence from childhood, at least, to the middle period of adult life.

I do not yet think there is a specific remedy for the cure of epilepsy; but the particular combination which has proven more serviceable in my own hands than any other, although I have tried a great variety—is that of one of the bromides, given in connection with the fluid extract of galium alba, and a certain proportion of digitalis. I say one of the bromides, because I think as a general rule, there is no advantage in combining the different bromides together, but there are some patients that will be benefited to a greater degree by the bromide of potassium, others by the bromide of ammonium, and still others by the bromide of lithium. It is not easy to determine which of these will do most good to the patient until they are tried. I have thought this rule applicable: that in those cases where there is a tendency in connection with the disease to inactivity of the kidneys, inclining the patient habitually to scantiness of urine, the bromide of lithium was found most beneficial. And in such I also give in connection with the bromide and galium, such doses of the wine of colchicum root as can be borne without disturbing the bowels, instead of digitalis. But in the large majority of cases, I have thought the bromide of potassium the more efficient article of this group. The formula which I have used much for the last twenty years consists of the bromide of potassium twenty-five grams (℥vi) tincture of digitalis, twenty-five c. c. (fl ℥vi) fluid extract of galium alba, ninety c. c. (fl ℥iii), and simple elixir thirty c. c. (fl ℥i). To an adult or person above the period of puberty, I have usually given of this formula, four cubic centimeters (fl ℥i) before breakfast and supper, and six cubic centimeters (fl ℥iss) at bed time. If the paroxysms of the disease recur at long intervals, it is sufficient in many instances to give but two doses a day, *i. e.* four cubic centimeters (fl ℥i) in the morning and six (fl ℥iss) in the evening. I have found it, however, advantageous, whenever the paroxysms of the disease have been found to recur with a sufficient degree of regularity so that it could be known about when the next paroxysm was to be expected, that the patient should commence at least a week before the time, to increase the medicine to three doses every day instead of two, and continue it at that rate till the time of the expected paroxysm had passed by. Then recede again to a dose morning and evening. In prescribing for younger persons the same combination may be used, but the dose must be diminished at the ordinary ratio to keep the proportion appropriate for the age of the patient. The reason for giving larger doses at night is, that a large proportion of epileptic patients have their paroxysms come either in the night or early morning. One important objection to the protracted use of the bromides, is their tendency to produce cutaneous eruptions, and sometimes to impair in some degree the nutritive functions. The tendency to induce cutaneous eruptions can in some instances be obviated for a considerable period of time, by adding a small proportion of the liquor potassii arsenitis to the formula that I have just mentioned; making the proportion such that an adult would get from two to four minims of the arsenical preparation in each dose. Guided by my own experience, I should say next in value to the combination that I have just given you, is valerianate of zinc in combination with such doses of the extract of stramonium, or conium, as will be borne without producing noticeable dryness of the fauces, or dilatation of the pupils of the eyes.

Recently, bromine itself has been recommended, I think, by Dr. Hammond, as a remedy quite as efficient in ameliorating the epileptic condition as any of the bromides. For administration, one cubic centimeter (fl 3¼) of the bromine may be put into two hundred and sixty cubic centimeters (fl ℥viii) of water, with three or four grammes (℈i) of the bromide of potassium, to render the solution of the bromine in the water more perfect. Of this solution, four cubic centimeters (fl ℥i) may be given further diluted with water, or sugar and water at the time of administration, three times a day. I have not had sufficient clinical experience with this remedy to express any opinion as to its value, although I should anticipate its effects would be very similar to that of the bromides, which have been so long and thoroughly tested. As I remarked before, so in closing this subject, I must remind you that a large part of your success in the management of cases of epilepsy will depend upon bringing them under treatment at an early period after the disease has commenced, paying close attention to a judicious regulation of the diet, exercise mental and physical, and to the careful maintenance of a healthy activity in all the important functions of the body. What I have thus stated in regard to the treatment applies to the disease as ordinarily presented to us for treatment, unconnected with any traumatic influence in producing it. As a matter of course, wherever cases of epilepsy are met with of a reflex character, and the primary seat of irritation can be determined, whether it involves the sentient nerves of the scalp, or any other part upon the exterior of the body, or a fracture or partial fracture of the bones of the cranium, or the existence of an irritable or diseased uterus, or irritating substances in the alimentary canal, in such cases I say, as a matter of course, the leading object of treatment must be the removal of the primary seat of irritation, with whatever remedies are necessary for that purpose. Traumatic cases usually are to be remedied by surgical interference, for the removal of spiculæ of bone, cicatrices and badly healed stumps after amputations, while diseases in the alimentary canal or in the viscera of the pelvis, male and female, or unusual sexual indulgence, must be treated and controlled by the practitioner, by the use of such remedies as each individual case calls for. I apprehend that if we, as practitioners of medicine, should study the individual cases of epilepsy that come under our care, especially those that are presented in the early stage of their progress, more carefully in relation to the particular cause or causes, and make a more intelligent and thorough effort to remove every point of irritation on the principles that I have laid down, a much larger number of cases of the disease would be permanently cured than have been heretofore. And yet I must admit, as I have already done, that after the disease has become of long duration or the habitual recurrence of paroxysms well established through a period of several years, it is really rare that any mode of treatment, however perseveringly followed, has succeeded in making a permanent cure or accomplishing more than a temporary amelioration of the condition of the patient.

LECTURE LXXIV.

Chorea—Its Causes, Clinical History, Pathology, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The disease denominated chorea, sometimes popularly called St. Vitus Dance, is met with most frequently in children between the ages of five and fifteen years. It may occur earlier than five, and sometimes between fifteen and twenty-five. But probably eight out of ten of all the cases of chorea that occur, have their commencement within the ages first named.

Causes.—A variety of causes have been alleged to be capable of inducing chorea, some holding the relation of predisposing, others that of exciting causes. Of the first, perhaps, an excitable temperament coupled with timidity of mind in children, constitute the most constant predisposing conditions. A very large majority of all the cases that come under my observation are in a class of children, embracing both males and females, of a rather anæmic or delicate physical condition and a decidedly timid, diffident condition mentally. Yet, these conditions are not present in all cases of chorea, for I have met with some children of apparently sanguine temperament, hardy, well nourished and without any special mental trepidation or timidity. As a general rule, girls are more disposed to the disease than boys, and I have known a number of instances in which season of the year appeared to exert an influence, the patients having their attacks renewed in some instances every autumn, for two or three years in succession, apparently coincident with the occurrence of cold, damp, and changeable weather. But in a large majority, it is not easy to trace any influence from the seasons of the year, or any particular diet or mode of life. Of the exciting causes, none are more prolific in developing the disease into activity than fear, coupled with mental anxiety. Children going to school between the ages of seven and ten years, of a temperament such as I have indicated, find it a little difficult to get their lessons to the satisfaction of their teachers, and are in consequence placed each day in a state of continual dread or apprehension, which renders it still more difficult for them to make progress in their studies; and in a few weeks, or months at longest, of this regular daily mental trepidation and anxiety, coupled with fear of punishment, and perhaps aided by the jeers of their comrades in the same classes, they are discovered to be subject to certain muscular movements of the face and of the voluntary muscles of the hands and arms, which at first are not infrequently mistaken for willful motions, and thus bring more scolding, more jeers, and add directly to the unhappy condition of the sufferer till the disease is fully developed.

The same mental conditions may arise in families without the child having any connection with the school room. In fact, any train of circumstances which tends to keep the child in a state of mental apprehension, coupled with more or less fear, strongly acts as an exciting cause of this variety of nervous disease. Another class of cases has been plainly traced to the influence of cold and damp air or sudden checking of perspiration. Indeed, not infrequently, the choreic movements have been associated with a moderate degree of rheumatic fever and soreness in different parts of the system, rendering it unmistakably a case of rheumatic origin. One of the earliest well-marked cases of chorea that came

under my care after entering upon the practice of medicine, more than forty years since, was in a hardy, well-nourished boy of twelve or fourteen years of age, who, after working with other members of the family in the woods, chopping wood, on an early spring day, with the coat off, incautiously went home without putting his coat on and became somewhat chilled. This was followed during the two succeeding days by a well-marked rheumatic fever, which abated somewhat during the following two days. But as the rheumatic fever diminished, severe choreic symptoms immediately followed, and proved quite persistent in its duration. It is probable that the cases to which I have alluded as recurring at certain seasons of the year, particularly in spring and autumn, are usually of the class that might be styled rheumatic cases, or such as originate from imperfect eliminations through the skin and kidneys, and consequent retention of the products of tissue metamorphosis until they act upon certain portions of the nervous centers, producing choreic symptoms, instead of upon the muscular and fibrous tissues, which would constitute ordinary rheumatism. Other cases have been alleged to originate from drying up of suppurative sores, such as ulcers, and still more by the sudden and rapid disappearance of chronic cutaneous eruptions. Long standing eruptions, like chronic eczema of the scalp and other parts of the system, on suddenly disappearing, have been followed, though not very frequently, by choreic symptoms. Still other cases have been supposed to originate from irritation in the alimentary canal, either from intestinal worms or indigestible food. It is proper to remark, however, that though I have observed a very large number of cases of chorea, I have no recollection of a single case that was connected either with intestinal worms or habitual indigestion; and I think not more than three or four in which there was any reliable evidence that the disease had originated from sudden drying up of ulcers, or the disappearance of cutaneous eruptions. But from impressions of cold and damp, I have met with a considerable number, while eight out of ten of all cases have been traceable to mental impressions of a depressing character coupled with fear, or from sudden and severe fright.

Clinical History.—In most cases the disease develops rather gradually, without any regular premonitory symptoms or warning, or any noticeable febrile stage. The first deviation from the natural condition noticed is usually the irregular movements of the muscles of one or both sides of the face. At first it may be merely an irregularly recurring spasmodic action or jerking of a particular muscle, either drawing the eyebrows up and forcing the eyelids together like a forcible wink, or more frequently, lifting one angle of the mouth. In a day or two after observing these slight spasmodic movements in some of the muscles of the face, the hand will be noticed to move irregularly, and sometimes when attempting to take hold of something it will be jerked suddenly in another direction. The feet may be moved in the same way. But if these symptoms have attracted attention or elicited inquiry, or if they are mistaken for voluntary movements, and any chiding or reproof is administered, it usually directly increases the difficulty, rendering the spasmodic action much more frequent and violent than it was before. Some cases hardly go beyond the slight symptoms I have named. There is no disturbance of the pulse, no increase of temperature, indeed no particular development of other symptoms, but simply these slight and variable involuntary spasmodic movements of particular muscles, either of the face or extremities, or of both. But in most instances where no remedies are interposed, the disease increases from day to day, and in about one week after

the first noticeable irregular muscular movements, they will have extended to nearly all the voluntary muscles of the face, neck, and both upper and lower extremities; not that they will all be in motion at one time, but alternately and with entire irregularity; the muscles of the arm moving one second, and next a twitching in the muscles of the face or in the neck, shoulders or feet, rendering the various muscular movements entirely unsteady and without any successive order, and sometimes throwing the patient into the most grotesque and ludicrous attitudes. During the second week in a majority of ordinary cases, the disease reaches its climax of development, when the muscular movements become so severe and frequent that the patients can make no steady progress in walking; the legs are jerked in such an irregular manner as to render walking impracticable, while the hands and arms are so suddenly and severely moved as to cause the dropping or throwing whatever may be in the hands, and rendering them incapable of even feeding themselves. Everything is thrown irregularly out of their hands, and they are sometimes not able to keep themselves in bed—the muscular movements of the trunk of the body as well as the extremities, throwing them from side to side until they will be dashed either against the walls along the bed, or out of the bed upon the floor. Where the disease becomes thus violent, there is usually considerable dilatation of the pupil of the eye, there is much difficulty in deglutition, and almost entire inability to talk, on account of the irregular movements affecting the muscles concerned, both in speech and deglutition. I have seen a few instances, where the spasmodic action during the paroxysms was so violent, that it required the constant attention of one or two persons to keep the patients on the bed, and prevent them from suffering more or less personal injury by the uncontrollable and irregular muscular movements. It is very rare that the muscular movements involve the sphincters of the body, but in a few instances the patients have been unable to control either their water or fæces. There is a decided paroxysmal character to the irregular movements in almost all the cases of chorea. There are periods of a few minutes at a time in which the irregular or spasmodic muscular movements will be very violent, extending over most of the voluntary muscular system, and then an interval of comparative quiet, sometimes lasting not more than two or three minutes, while at other times the intermissions between the paroxysms will be from fifteen to thirty minutes of almost entire repose. But in nearly all instances during sleep, the irregular muscular movements cease, and many of the choreic patients sleep as quietly as though they were in perfect health. I have noticed only a few exceptions to this rule, in which some slight degree of spasmodic action continued during sleep. The natural tendency of the disease, as I have just remarked, is to reach the climax of its development during the latter part of the second week, continuing with but little change until toward the middle or latter part of the third week, when, in most cases, there begins to be a decline or an apparent tendency to spontaneous recovery between the end of the fourth and that of the sixth week. Mild cases have terminated earlier, and the severer ones sometimes have been protracted not only six weeks but as many months. As an ordinary rule, during the whole progress of the disease the patient retains a moderately fair appetite, the evacuations remain nearly regular, though sometimes inclined to costiveness, the urine usually of rather high specific gravity, and perhaps less in bulk than natural, although this varies with different cases. A few that have come under my observation made larger quantities of limpid urine than in health. Patients with this disease are usually also free from pain, except such as are of rheumatic

origin. These usually complain of more or less severe headache, and general muscular soreness or hyperæsthesia; and, so far as I have observed, the urinary secretion is less than natural and of a deeper red color. During the first week, there is slight elevation of temperature and acceleration of pulse. But aside from this, I have noticed no general febrile phenomena, or any considerable pain connected with the disease. In the severer cases, where the paroxysms and violent muscular movements combined are such as I have described, the patient becomes exceedingly weary, apparently through voluntary efforts to lessen the uncontrollable movements. After the first two weeks there is noticeable usually some loss both in flesh and strength. The countenance is usually expressive of despondency, and the color of the lip evidently indicates impoverishment of the red corpuscles of the blood.

While the descriptions I have given from the lighter class of cases to the more severe as they are usually met with, apply to those of most frequent occurrence, many show deviations that require mention. Among the more common of these deviations is the confinement of the disease to one side of the body, particularly one side of the face, one arm or one leg. In a few instances this has been well characterized, the muscles of one side being actively involved in the disease, while hardly an irregular movement can be detected upon the other. In other instances, the disease is confined entirely to some limited portion of the voluntary muscles, such as those of the face alone. In other instances, the arms, the feet and legs, and in not less than three cases, I have found the patient apparently affected only in the muscles of the diaphragm and the anterior walls of the abdomen producing very marked and characteristic interference with the regularity of the respiratory movements, and of course with the regularity of the speech. One of these cases was a young woman of eighteen, who came from the interior of the State, and had been previously affected by the disease for some six months. It was limited entirely to the muscles of the trunk and diaphragm, cutting short her words at irregular intervals when conversing, forcing the breath suddenly out or stopping the respiratory act once or twice in its progress. In another case also, a young woman of twenty years, the disease was limited apparently entirely to the abdominal muscles and diaphragm, not affecting the muscles of the chest above the diaphragm, but involving the muscles of the abdominal walls in front to the pubis. But you must be prepared to meet with irregular choreic action in almost any of the muscles of the body or extremities, either as affecting single muscles or associated groups, co-operating in certain movements.

Pathology.—As uncomplicated cases of chorea rarely terminate fatally, but few opportunities have occurred for post-mortem examinations or for studying the structural changes that might be supposed to occur in the cerebro-spinal portions of the nervous system. But the disease, as ordinarily met with, is so purely one of functional or temporary disturbance, tending toward recovery, that it is not probable that the closest scrutiny would detect any structural changes in the cerebral or cerebro-spinal structures, that could be considered as characteristic of this disease. The essential pathological condition connected with it, is undoubtedly one of a peculiar morbid excitability of certain tracts of nerve matter in the cerebro-spinal axis, extending perhaps more or less to the corpora-striata and optic thalami. The phenomena of the disease may originate in two ways, one by direct radiation of irregular nerve force upon voluntary muscles, bringing them into irregular, involuntary action; in the other, not so much direct radiation of irregular nervous influence, as the loss of

the power of the cerebral hemispheres to control and direct voluntary movements. The latter is the case in most instances, where the disease has originated from mental influences, acting upon a timid nervous temperament, while the former, the direct establishment of irritative influence, is the predominating pathological condition in those cases which originate from exposure to cold, wet, and other causes, which would favor the development of the rheumatic irritation, and from the drying up of ulcers, or the sudden disappearance of cutaneous eruptions. There is no evidence that any, except well marked rheumatic cases, are accompanied by any distinct hyperæmia or increase of blood in the nervous centers. On the contrary, the absence of fever and local heat in the head, the predominance of paleness, anæmia and dilatation of the pupils, as the disease becomes more severe, all indicate rather an anæmic condition of nerve centers, than anything meriting the name of hyperæmia or fullness. But in some of those cases which originate from causes tending to suppress either natural or unnatural secretions, there are often indications both of febrile disturbance, and of hyperæmia of the central portion of the nervous system.

Diagnosis.—The symptoms of chorea after they have been once observed are so characteristic and different from almost every other variety of irregular muscular action, that there is very little danger of mistakes in diagnosis. The action of the muscles in an irregular or entirely incoherent manner, at no time obliterating the patient's consciousness, or wholly obstructing the respiration, so as to produce the ordinary phenomena of convulsions, the recurrence of the movements every few minutes, all tend to distinguish it from any form of general convulsion. The long relaxation of the muscles in the intervals between the short, spasmodic jerking, separate it at once from all forms of tetanic rigidity, or cerebral disease accompanied by ordinary paralysis with a rigidity of muscles; and on the other hand, it only requires the observation of a single case to see a broad difference between the muscular movements occurring irregularly, first in one place and then in another, with intervals of rest after each paroxysm, and the steady tremulous shaking of paralysis agitans. There is indeed no other form of nervous affection that exhibits phenomena which, in their aggregate, have any near resemblance to those of chorea.

Prognosis.—As a general rule, the prognosis in chorea is favorable. Although I have met with a large number of cases of this disease, and at almost all stages of their ordinary progress, and in all grades of severity, I have known no cases which terminated fatally, and I think only three that did not recover. These three were in adults, all of whom before coming under my observation, had suffered from the disease for periods varying from fifteen to twenty years, and, at the time, had evidently become complicated with symptoms indicating structural change in certain parts of the spinal cord and medulla oblongata somewhat similar to that in progressive locomotor ataxia. Cases that are brought under observation and are subject to proper regulations in the early stage, will always end in recovery, and usually within a period of from three to six weeks.

Treatment.—The first object to be accomplished in the treatment of chorea is, so far as possible, to remove the further operation of all such influences as might have constituted exciting causes, or more properly, of such influences as might have contributed to the development of the disease. This is particularly necessary in all such cases as have originated mainly from mental influences. The child, if attending school,

should be at once removed, if for no other reason than from the fact that it is impossible for a child to attend school, laboring under this disease, and not attract the attention of the other scholars. If the teacher himself suspects the nature of the disease and treats the child with admitted judiciousness, the attention of other children will be constantly attracted to the awkward and grotesque movements, and their observation and conversation will most certainly tend to perpetuate the disease in this class of patients. Another objection is, that there are liable to be other children of temperaments favorable for developing the same disease, and the presence of one case very generally creates more or less disposition to imitate it on the part of others, which sometimes actually develops the disease in the imitators, and thereby increases the number of cases among the children thus associated.

After removing the child from contact with other children as far as is practicable, both in the school and in the neighborhood, and directing that it shall be provided with such influences, proportioned to its age, as will divert its attention and promote its cheerfulness, secure for it some exercise by riding and outside exposure, always in company with some cheerful attendant, who will be ready to pass every awkward and irregular movement by unnoticed. And the parents or immediate attendants should be strictly enjoined to pass all irregular movements, blunders, or accidents that the child may make with as little notice as is compatible with the safety of the patient, and that all mistakes or accidents resulting from spasmodic movements, either in attempting to feed themselves or to hold anything in their hands, should be overlooked or excused with a word of encouragement and cheerfulness. I speak of the necessity of thus directing the management of patients suffering from chorea produced by mental influences, from having frequently observed that in all the working classes of people, and indeed, more or less among all classes, there is great proneness to a directly opposite mode of management. The anxiety of the mother causes her to pay attention to every awkward movement, and in the earlier stage of the disease, not understanding its nature, until it has been aggravated to its highest degree of development by her chiding and upbraiding or liberally scolding for almost every awkward movement the child may make. For the more the patient is scolded, the more irregular and excited its movements become. Consequently, one of the most important items in the management is to place the patient in a comfortable condition of air and warmth, a plain unstimulating, but nutritious diet, and in the immediate care of judicious and cheerful companions and nurses. Indeed, this alone will serve to restore the larger proportion of this class to health in from three to four weeks. I have said that the diet should be plain, unstimulating, but sufficiently nutritious and easily digested. The patient needs a fair amount of nutriment, yet the digestive organs should not be overtaxed, and especially with indigestible food. Tea and coffee should be either prohibited or used sparingly; and no other so-called stimulating drinks should be allowed, either fermented or distilled. Attention should be given to the condition of the evacuations, both from the bowels and the renal organs, sufficient to see that the bowels are moved naturally and regularly, but without the debilitating effects of physic, and that the urinary secretion is sufficiently abundant to fully separate the elements of the urine from the blood. In most instances there is very little variation from natural in either the digestive organs or renal function. In those cases which have arisen mostly from mental influences, the medical treatment should have two objects in view. One mildly tonic, the other anti-

spasmodic or quieting to irregular nervous action. The particular remedies which have appeared to exert the most reliable control over the progress of the disease and lead to the earliest recovery, have been valerianate of zinc, and liquor potassii arsenitis or Fowler's solution. To patients between the ages of five and ten years, I have usually given thirteen centigrammes (gr. ii) of the valerianate of zinc, usually in the form of a gelatine-coated pill, for convenience of administration, before each meal and at bed-time, and from three to five minims of the liquor potassii arsenitis in 15 c.c., or a tablespoonful of water just after each regular meal. For the last twenty years I have met with but very few cases of the variety of chorea to which I am now alluding, that have not yielded to this treatment, and become convalescent in from two to three weeks. In a few instances I have had to continue it four weeks, and in a still smaller number of cases I have found the arsenical preparation to produce disturbance of the functions of the stomach, constituting loss of appetite, and sometimes griping and a little looseness of the bowels, and have been obliged to discontinue it on that account. I think, perhaps, in two or three cases it has interfered with the action of the kidneys, and led, in less than a week from the time it was commenced, to an œdematous condition and puffiness of the loose tissue under the eyelids in the morning, and more or less of œdema about the tops of the feet and ankles during the afternoon and evening. Of course in all such cases it was immediately discontinued. When the arsenical preparation in any respect disagrees (and you should never administer it without taking subsequent care to note its effects) the patients frequently will recover in a reasonable time under the influence of valerianate of zinc alone. If they are unusually restless at night, one moderately full dose of valerianate of ammonium given at bed-time, will both secure rest during night and contribute to steady the irregular muscular action during the following day. A combination of the bromide of ammonium and hydrate of chloral, in doses suited to the age of the patient, given morning and evening, has sometimes acted very favorably in removing the irregular muscular movements, and at the same time promoting sleep at night. In those cases which have come under my observation of the most severe character, in which the paroxysms had rendered the patient wholly unable to walk or talk or even to swallow without more or less difficulty, requiring one or two attendants constantly to keep them in bed, I have found it of great advantage to administer once or twice in the day, say morning and evening, a warm douche upon the occipital region and back of the neck. The mode of administration has been to bring the patient's head and neck out from the front edge of the bed, horizontally over a tub, with the face downward, and from a pitcher holding one or two quarts of warm water, not hot, but simply warm as is comfortable, and, holding the pitcher from one to two feet above the head, pour a continual stream upon the occipital region of the head and neck. The position is such that the water runs directly off into the tub, and when from one to three quarts have been thus poured in a steady stream, the water is wiped quickly off and the patient laid back upon the bed to rest. In most instances the douche is followed by one or two hours of continuous rest, with but little muscular agitation. And a repetition of it once or twice a day during the week that the disease is at its climax, or while it is approaching its climax, has seldom failed to greatly facilitate a cure. When patients are very anæmic they may be benefited by giving more or less of those preparations which are regarded as calculated to promote nutrition, and especially to favor the formation of red corpuscles of blood. With such the arsenical preparations may be

given in direct conjunction with suitable doses of the lacto-phosphate of lime compound syrup of the hypo-phosphites, or with the compound tincture of cinchona, which perhaps constitute the best of the class of nutrient tonics that we can use in such cases. I do not mention the preparations of iron, for the reason that in a majority of instances in which I have tried them they have seemed to me either to produce headache after a few days or to actually increase the irregular muscular movements. This has led me to think that iron is not well tolerated in that peculiar condition of the nervous system giving rise to choreic movements. While the treatment that I have now mentioned is that which my experience has shown most successful in the treatment of the common class of cases of chorea, those arising from sudden exposure to cold, and that are plainly associated with more or less of a rheumatic grade of irritation, will not so readily yield to the same remedies. But they require to be carefully discriminated and early subjected to the influence of a different class of remedial agents. Such cases, at their beginning, while there is some feverishness, general muscular soreness, some degree of headache, with slight acceleration of pulse, will perhaps be more promptly benefited by a solution of salicylate of sodium in connection with tincture of cimicifuga racemosa and gelsemium, than by any other remedies. A combination of these three medicines in such proportion as to adjust the dose of each to the age of the patient, aiming to get a fair but not exaggerated influence, and given once in from four to six hours, will usually produce decidedly ameliorating effects within the first five or six days, and sometimes entire relief of all the symptoms. A case to which I have already alluded that occurred during a very early period of my practice, in a boy, who, in returning from his work was suddenly chilled, and soon after attacked with very severe chorea, was entirely relieved and convalescence established by the use of the warm douche applied thoroughly twice a day for the first three days, once a day afterwards, and the internal use of a combination of the tincture of cimicifuga, wine of colchicum root and tincture of stramonium. Cimicifuga has been recommended by many in the treatment of chorea, but I am satisfied that its efficacy is restricted almost entirely to the rheumatic class of cases. And in those, either alone, or still better in conjunction with salicylate of sodium and moderate doses of stramonium, it will certainly produce very satisfactory results. Colchicum is particularly valuable as an addition to the treatment in such cases as are accompanied by more or less constipation and checking of the urinary secretion. It may be pushed until it produces some laxative effect, but should not be carried so far as to produce hyper-catharsis or intestinal irritation. Many other remedies have been suggested and used in the treatment of cases of chorea, but if you keep in mind the fact that the disease is only a functional disturbance, consisting mostly of a morbid state of excitability coupled with a tendency to anæmia, impoverishment of blood and mental depression, and that your remedies are to be adjusted for the relief of these, you will seldom be at a loss to find in the materia medica sufficient material to fulfill the indications presented by the disease. You should remember that the earlier cases are brought under proper domestic regulations, such as will remove them from all causes calculated to aggravate the disease, the better will be the prospect of a speedy and permanent cure. Only one additional word in relation to preventing a recurrence of the disease. In a few instances, I have found relapses to occur by allowing children who had recovered from attacks to resume their school duties early, and thereby expose them to the same influences that had contributed to develop the disease at first. Care should be exercised in this regard,

and the children either not allowed to return to school till such time as recovery has been well established, or what is better by far, the children should be placed under such teachers and in schools of such select, limited numbers, as will enable the patients to enjoy a reasonably judicious mental training and development, with but little liability to exposure to influences that would provoke a return of the disease.

LECTURE LXXV.

Catalepsy and Convulsions—Their Clinical History, Pathological Relations and Remedial Management.

GENTLEMEN: The next subject to which I will direct your attention is called catalepsy. It is one of the most infrequent of the functional disturbances of the nervous system possessing the characteristics of a distinct disease. Although occurring very rarely, it has been recognized and described from a remote period of medical history. It occurs most frequently during the period of youth and the early part of adult life, and seems in nearly the same ratio of frequency in both sexes. The causes of the disease are not well ascertained, although particular cases have been found to originate from malarious influences, and to exhibit distinct periodicity in the recurrence of the paroxysms; others have been apparently developed by strictly mental influences, such as strong mental emotions; and in others no direct exciting cause has been traced. An excitable, or what is recognized as a nervous temperament, coupled with more or less anæmia, or impoverishment of blood, and also such mental conditions as cause a predominance of despondency or melancholia are regarded as predisposing causes. This disease, though presenting symptoms during its more positive manifestations or paroxysms, somewhat uniform and characteristic, is evidently closely related in some instances to hysteria, in others to particular forms of insanity, while in other and very rare instances, it seems to depend upon the action of malaria on a peculiar prior condition of the nervous system. And hence the cases met with in practice may be grouped into three classes: the malarious, hysterical and psychical, or such as are associated more or less with mental derangements.

Symptoms.—Most cases of catalepsy occur in paroxysms, entirely irregular as to the time of their recurrence, and generally commence suddenly, with no well-marked premonitory or prodromic symptoms. In some of the cases, however, a marked development of symptoms is preceded for one, two or three days by unusual taciturnity of mind, indisposition to converse, with insomnia, or disturbed sleep at night. In other cases the paroxysms have been preceded by unusual hilarity, nervous excitability, and a rapid passage of emotions from one extreme to another. But in the larger majority of cases the development of catalepsy occurs suddenly, and consists mainly in a suspension of cerebral consciousness coupled with general rigidity of the voluntary muscular system, leaving the patient in a condition apparently oblivious to surrounding objects or conditions, manifesting no apparent consciousness either to the touch or to the infliction of external injuries, or to the observation of conversations that may take place in their presence. But the muscular rigidity is of

such a character that the flexors and extensors are usually evenly balanced, leaving the patient directly in the attitude in which the attack supervened, whether standing, sitting or recumbent, as though the muscular system had suddenly assumed an entire fixed condition, offering a certain degree of resistance to all attempts to move the patient from the attitude in which the attack supervened. Muscular rigidity, however, will usually yield gradually to moderate force, allowing the limb to be raised, lowered, or moved in any direction, not suddenly by muscular action, but as though it were the yielding of an inelastic body to superior force, and the part remains in whatever position it may be placed by such force. This maintaining its position, however, in any particular attitude in which a part may be placed is not permanent. For instance, if the arm or limb be raised or extended and left unsupported, while it retains its position for a time, usually after ten to twenty or thirty minutes it slowly, without tremor or vacillation, yields to the force of gravity until it reaches a point of support. But for a brief time the limbs or body may be molded into almost any shape, and they retain for a time the position in which they may be placed. In two cases of a strongly marked cataleptic character occurring under my observation in the Mercy Hospital, at different periods of time, the rigidity of the muscular system was well marked, and the suspension of consciousness, or incapability of receiving external impressions, was such that no manifestations were obtained by the most varied efforts and experiments; and the house physician at that time, although expert in devising measures for testing the reality of the apparent suspension of consciousness, as well as fixedness of the musuclar condition, tried many expedients, including electricity, without producing the slightest apparent effect.

In these cases the paroxysm continued in one five or six days, and in the other between two and three weeks. In the great majority of cases, however, the paroxysms of unconsciousness and muscular rigidity are of shorter duration. In some they remain only for a few minutes, in others one to three hours and from that up, as I have intimated, to as many weeks. Of course, in those cases where the suspension of consciousness and rigidity remain more than a single day, there is danger of progressive exhaustion from inability to nourish the patient without resorting to more or less forcible means for that purpose. In almost all cases the paroxysms of this unconsciousness and rigidity cease almost as suddenly as they supervene. The patients often appear as though they had just awakened out of a profound sleep, and not infrequently yawn once or twice, look about them as though in a strange place, and present all the expressions and movements of those who had recovered wakefulness directly from a protracted state of oblivious sleep. They usually resume their movements, however slowly, and exhibit a considerable degree of feebleness during the first few hours, and sometimes for one or two days, if the paroxysm has been protracted. There are various degrees of severity in the paroxysms of catalepsy. Some of the cases that have been termed catalepsy, and described as such, might better have been termed instances of simple trance, being temporary suspensions of consciousness, with little or no true muscular rigidity. While in the cataleptic paroxysms the muscular rigidity is restricted essentially to the nerves and muscles of voluntary motion; there is at the same time a diminished action in some of the involuntary movements. Respiration, for instance, is usually performed much less efficiently than in the natural condition. In those cases that have come under my own observation the ordinary respiratory movements in the paroxysms have been so inefficient that it required close

watching to observe any expansion and contraction of the chest, or the ordinary motions of inspiration and expiration. While this was the case, however, with the ordinary respirations, every few minutes this inefficiency was compensated for by a single, slow, long inspiration, resembling a sigh. And this sigh or extra respiratory movement constituted the strongest indication of the patient's capacity to move that was observable during the paroxysm. The face is usually pale, the extremities cool, pulse soft and easily compressed, but nearly of the natural frequency. In those cases which are dependent for a direct exciting cause upon malaria, the termination of the paroxysm is usually accompanied by temporary sweating, and sometimes it is begun by a noticeable coldness and blueness of the lips and nails, as though there was a slight semblance of a chill.

Pathology.—Catalepsy being a very rare disease, and the cases that have occurred rarely terminating fatally unless when associated with cerebral disease, or some of the forms of insanity, there have thus far been discovered no characteristic appreciable lesions of the nervous centers, on which the phenomena could be said to depend. And it is probable that uncomplicated catalepsy is purely a functional disturbance of the nervous centers, consisting in the temporary loss of cerebral recognition, or mental perception of outward impressions, with coincident radiation of sufficient nervous influence through the nerves connected with the voluntary muscular system to hold that system in a state of rigidity, in equipoise, or fixedness. Some writers have suggested that contraction of the muscular fibers was the natural condition of that structure, and style rigidity as the natural muscular tonus, and endeavor to explain the general, equal rigidity of the whole voluntary muscular system, on the supposition that the nervous force commanding muscular movements and muscular action is like that of the cerebral function, suspended. And, instead of the nervous impression commanding muscular rigidity, it is simply a withdrawal or temporary suspension of all nervous influence, allowing the muscular structures to resume their supposed natural tonus, in a fixed or rigid state. The difficulty, however, with this theory is, that the fundamental proposition of the existence of a natural muscular tonus has no adequate proof. It must be confessed that it is difficult in the present state of our knowledge, to furnish a satisfactory explanation of all the phenomena or symptoms, which constitute an attack of catalepsy. That it is a functional disturbance, not involving necessarily structural changes, is quite evident from the readiness with which paroxysms come on, and the equal readiness with which they pass off, and the almost universal tendency to recovery, or at least to avoid fatal consequences.

Diagnosis.—The simple description of the symptoms which I have given you furnishes the best means for diagnosis. There is no other form of disease that gives the same assemblage of symptoms, namely, the coincidence of suspended cerebral recognition of impressions from without, with a steadily balanced and continuous state of rigidity of the voluntary muscular system. Tetanus, hysteria, and all the various forms of irregular muscular action, are more particularly paroxysmal, and are associated with other coincident phenomena, entirely different from that of catalepsy. In simple trance, and in the various conditions of peculiar mental emotion that are sometimes observed, there is lacking the muscular tonus, or rigidity, which belongs to the cataleptic state.

Prognosis.—As I have already stated, the prognosis having reference to the amount of danger to the life of the patient, may be said to be favorable in all cases that are not complicated with mental diseases, or some form of insanity; but, so far as relates to the prospect of recovery in the

sense of being exempt from liability to recurrence of paroxysms from time to time, the prognosis is not so favorable; there being a strong tendency in the disease to an irregular recurrence of attacks, in some at long intervals and in others more frequently, especially when the patient has passed the period of puberty. If it is certain that the paroxysms depend for their exciting cause upon malarious influence, the prognosis is decidedly favorable. Such cases are usually permanently cured, first, by antiperiodics to interrupt the paroxysms, and subsequently by proper attention to the improvement of the general health and tone of the nervous system. When they occur at, or before the period of puberty, proper attention to their physical and mental training continued for one, two or three years will usually destroy their liability to recurrence of attacks and secure for them a permanent recovery.

Treatment.—The treatment evidently divides itself into two parts: that which is required during the paroxysm, or the continuance of the attack, and that which is necessary for preventing its recurrence. In cases where the patient has already passed through one or more paroxysms, and it has thus been ascertained that they are of temporary duration it is not desirable to institute decided and active measures of treatment till the paroxysm has passed by. But if the paroxysm is more lasting, extending any period beyond twenty-four hours, some measures may be resorted to with the hope of shortening its duration, and thus restoring the patient's ability to take nourishment before material exhaustion has taken place. Among the expedients that are perhaps most likely to terminate the paroxysm, are sudden dashing of cold water upon the face and naked chest, which sometimes will bring a sudden inspiratory effort coupled with an immediate return of consciousness and ending of the paroxysm. Moderate electric shocks will sometimes succeed in producing some effect. Both, however, have frequently been found ineffectual, and all other similar expedients. Sometimes the administration of enemas, containing such remedies as assafœtida, valerian, camphor, or almost any of this class of antispasmodics and stimulants, have been found sufficient to arouse the patient, and end the paroxysm. In the two cases to which I have alluded in the hospital none of these expedients had any effect. In one of them, milk or any item of liquid food, when the underjaw could be depressed sufficiently by a moderate, steady pressure to allow nourishment to be placed far back upon the tongue, would be swallowed slowly, but sometimes with difficulty and some danger of choking. But it was tedious and difficult to administer enough to adequately sustain the patient. Enemas of milk and beef tea were generally retained when given in quantities not exceeding 90 or 120 cubic centimeters (fl. ʒiii to ʒiv) at a time, and constituted the principal dependence for nourishment. In the patient in whom the paroxysm continued beyond the second week and symptoms of exhaustion became strongly marked notwithstanding the efforts to nourish him by enemas, I found great difficulty in getting his mouth sufficiently open to place anything upon the back part of the tongue. It appeared to me that it was one of the cases closely allied to insanity as it had been preceded for a considerable time by melancholia. The difficulty of administering nourishment by the mouth appeared to be increased by some voluntary resistance added to the rigidity constantly existing. But the necessity for more nourishment became so urgent that the nurse and house physician proposed, at one of my visits, that we forcibly introduce the stomach tube and pour nourishment into the stomach. Being satisfied from what I could learn of the history of the patient that there had been some indication of mental derangement, it

occurred to me that possibly a little strategy might be valuable, and after talking freely by the bedside about the necessity of resorting to forcible administration of nourishment in the manner I have just suggested, I made the remark, that if there was no change by the next day we would resort to it, but would postpone it that long. As we stepped beyond the hearing of the patient, I instructed the nurse to do as he had been in the habit of doing every day, *i. e.*, bring the patient nourishment, make some little effort to feed him, but without much persistence, and then, as if doing it carelessly, or by accident, in the evening leave a bowl of milk upon a stand directly at the bedside of the patient, where it could be easily reached, if the patient were disposed to reach it during the night. This was done, and the next morning the milk was gone, with reasonable certainty that no one else had meddled with it but the patient. For three or four successive evenings the milk was left in a similar way, and uniformly disappeared before morning, at the end of which time, the patient was found early in the morning out of bed, standing motionless as a statue, in undress, gazing at a picture upon the wall. He was persuaded with a little assistance, again to resume his bed, and from that time on slowly recovered his perceptions, and with apparent reluctance took nourishment, and became better from day to day, and in about four weeks more had regained a fair degree of strength. And although decidedly indisposed to talk much, he left the hospital apparently sane, and in a pretty good physical condition. The treatment which is required in the intervals between the paroxysms of a case of catalepsy must be varied to suit each individual case. Where the patient is under malarious influence, the prompt use of efficient, though not exaggerated doses of antiperiodics mild tonics, easily digestible food, passive exercise in the open air by riding, and avoiding direct physical fatigue, constitute the means which will usually speedily restore such patients to entire health. In those instances that prove to be connected with mental disease, there is almost always more or less structural change in some portion of the brain, and usually all treatment proves only palliative, so far as restoring the patient's health, and the cerebral disease goes on to its usually fatal result, whether the cataleptic paroxysms continue to recur or not. The treatment of such cases must be governed entirely by the indications afforded by the accompanying form of cerebral or cerebro-spinal disease. There are cases, however, that are neither influenced by malaria, nor by organic structural changes, but are more allied to hysteria, in which the two leading objects of the treatment in the intervals, will be to diminish the morbid excitability of the nervous system, on the one hand; and to support strength and functional regularity, especially in reference to digestion, assimilation, nutrition and regularity of excretory actions, on the other, as the best and surest means of preventing a recurrence of the cataleptic paroxysms. Good air, moderate outdoor exercise in proportion to the strength of the patient, encouraging and cheerful mental influences where it is practicable, and change from the interior to the sea-shore in the summer, and especially, in all cases, such measures as tend to give cheerfulness and mental courage, and light but varied occupations, will be found of much benefit.

Convulsions.—Although there is no disease of the nervous system which can be properly designated convulsive, or justify the use of the word convulsion, to indicate any particular disease, yet a few words in regard to convulsions in the abstract may not be unprofitable. General, irregular muscular contractions, or what are termed clonic spasms, or fits, are simply symptoms of some prior or coincident pathological condition,

and not a distinct disease. The convulsive affections that we meet with may be arranged under various heads, according to the pathological conditions, or diseases on which they depend. Most writers speak of infantile convulsions, hysterical, puerperal, renal, and epileptiform convulsions. The latter I have already sufficiently considered, in the remarks upon epilepsy. The renal convulsions, by which are meant convulsions dependent upon retention of the elements of urine acting upon the nervous centers, I have also sufficiently considered in connection with inflammatory diseases of the kidneys. Puerperal convulsions, many cases of which are closely allied to the renal, are fully considered in works upon gynecology and obstetrics, and are not considered as within the domain of practical medicine. The hysterical, will be more appropriate under the head of hysteria, to which I shall soon direct your attention.

This leaves me only what has been styled infantile convulsions for brief consideration at the present time. And even a large part of the cases of infantile convulsions may be traced to one of the preceding classes. Not a few of the convulsions that occur in infancy, although not often recognized as holding that relation, are nevertheless strictly epileptic, recurring at intervals of one, two, three, or six months, sometimes in single paroxysms, sometimes in two, three, or four paroxysms, in quick succession. These patients speedily recover, and go on again without any apparent cerebral lesion, or associate morbid condition. Consequently parents and sometimes the physician come to regard them as dependent on some temporary cause. If it is before the teeth have all come through, most of them will be referred to the supposed progress of some one or more teeth that are crowding upon the gums. If there is no opportunity to render this cause available, worms will be called into requisition as irritating the alimentary canal; yet I have never seen a case in which worms were procured by any quantity of worm medicines administered to this class of subjects. The truth is, however, that the cases to which I now allude, and that begin often as early as six months of age, and make their appearance more or less approximating to regularity once in three, four, or six months, are true epileptiform convulsions in infancy and childhood. Sometimes, although disappearing from the third or fourth years of age up to that of puberty, and re-appearing at puberty, the spasms then are for the first time recognized as epileptiform, and in many of the cases without any recollection of the paroxysms suffered in infancy. Such cases require the same remedies, administered under the same general principles of treatment that I have already given you as applicable to cases of epilepsy generally. And it is desirable that you pay close attention to every case of convulsions that occurs in young children, and disappears leaving no marked symptoms of serious cerebral lesion, and recurs again without adequate cause at some stated period of time; because, if recognized, and put upon such regimen and remedies as are known to produce the most effect in controlling epileptic disease, there is the best chance of effecting a permanent cure. There are also some cases in childhood, or even in infancy, in which convulsions depend upon inadequate elimination of the urinary secretion, and are true uræmic convulsions.

It is frequently the case that convulsions have occurred for the first time in infants and young children during the period of convalescence from attacks of the eruptive fevers. Aside, however, from these cases, we meet with convulsive attacks in children of more or less severity, that can not be referred to any other than temporary causes acting upon a peculiar susceptibility of the cerebro-spinal nervous centers, more especially that

part of the cerebro-spinal axis which is related to the voluntary muscular system, and the voluntary nerves of sensation. There are many infants and young children in whom there is undue excitability in this portion of the nervous apparatus, and trifling causes of an irritative or exciting character are liable to bring them into paroxysms of general convulsive movements. Children born of scrofulous or tuberculous parents, are perhaps more liable to have this peculiar excess of excitability in the nervous system than any others. Next to these are children born of parents who are themselves subject to hysteria or epilepsy, and have themselves inherited what might be called a hysterical temperament. Those born of scrofulous or tuberculous parents in addition to the morbid excitability favoring the ready development of convulsive paroxysms, present also a strong tendency to more or less permanent hyperæmia of the membranes and surface of the brain, which, if not carefully and persistently counteracted, is liable to terminate in effusion, constituting a form of hydrocephalus, which will terminate fatally at some future period, either with or without the development of miliary tubercles in the membranes and surface of the brain. Those infants and young children that possess what I have styled as the hysterical excitability of the nervous system, either by inheritance or otherwise, are liable to be attacked with general convulsions whenever any temporary causes are brought to bear sufficient to produce fever or increase of temperature and rapidity of circulation, such as the supervention of scarlatina, variola, or even more transient fevers, and on the other hand by the occurrence of any causes that act slowly but persistently on the peripheral extremities of the sentient nerves, whether spinal or ganglionic. It is in this class of young children that we every now and then find a paroxysm of violent general convulsions on the first development of the febrile symptoms, which usher in any one of the eruptive or general fevers. It is in the same class that temporary derangements of digestion from taking indigestible food, or the presence of worms or any species of irritative influence in the alimentary canal, acting upon the sentient nerves of organic life, produce convulsions.

In the same class of children after they have passed the period of infancy, between three and five or six years of age, strong mental excitement, constant fear, injudicious and violent chastisement, will not infrequently cause the development of convulsive paroxysms. Yet, in all this class of cases the convulsions are usually of brief duration, and not often repeated, or more than one paroxysm at a time. The patient usually recovers quickly and fully from the attack, thus distinguishing them from cases that depend upon cerebral disease, in which, when the convulsive paroxysm passes away, the patient is still left with moderate fever, and other symptoms of cerebral disturbance. It is not necessary to absorb your time with a description of what is usually called a convulsion or fit. The sudden suspension of consciousness, the characteristic irregular motions of the eyeball, jerking of the muscles of the face, choking in the neck as if strangulating, are followed in a few seconds by general clonic spasms. The suspension of respiratory movements, causes the lips and face to become turgid with dark venous blood, finally ending in a gradual relaxation, until in a few seconds more the muscular rigidity is gone and the patient lies as if in a sleep, although breathing stertorously from the accumulation of phlegm that has taken place in the mouth and fauces during the time of the general convulsive movements. So striking is this assemblage of symptoms that even non-professional persons at once style them a convulsion or "fit." The patient left alone lies as if in a sleep for a period varying from a few minutes to half or three quarters

of an hour, but on awakening, speedily recovers from all bad symptoms, unless, after the blood has again become well oxygenized and decarbonized, a second paroxysm should supervene. These phenomena are so familiar and characteristic, as constituting a convulsive paroxysm, that it is unnecessary to describe their variations or their degrees of severity. As you will infer from what has already been stated, the essential pathological condition is the morbid excitability, or susceptibility of the cerebro-spinal nervous centers, acted upon by some temporary exciting cause. The treatment, as in cases of catalepsy, divides itself into that which is necessary during the paroxysms, and that which is required after the paroxysm has passed by, to prevent its recurrence and restore the patient more fully to a normal or healthy condition.

Most convulsions are so temporary in their duration, so completely and necessarily self-limited, that the treatment really, during the convulsion, is of no value. But the terror of parents, nurses, and attendants, at the primary appearance of the convulsive movement is such, that the most rapid and instantaneous efforts are made to apply remedies with the expectation of relieving the patient. Of course, with most of the people, whatever remedies happen to be in use at the time the paroxysm subsides gets the credit of having stopped the "fit," when in ninety-nine cases in a hundred it had no influence whatever. In fact, a general convulsion must necessarily be self-limited in its duration. Suspending, as it does, respiratory movements, checking the oxygenation and decarbonization of the blood, the rapid accumulation of carbonic acid gas in the blood and the exclusion of oxygen, quickly puts the blood in a condition capable of producing the most reliable and speedy sedative effect upon the nerve excitability that could be found, and consequently furnishes its own remedy, so far as the continuance of the convulsive paroxysms is concerned. Still, for the simple effect upon the attendants, it is well enough to apply cold cloths to the head, warmth to the feet, sinapisms to the central part of the spine between the shoulders, and near the junction of the back with the neck, and on the center of the epigastrium; these sinapisms should not be left long enough to actually blister, but simply to produce temporary external irritation. If the convulsion is repeated as soon as the patient has fairly recovered consciousness and re-oxygenation, it may be desirable to help shorten the paroxysm by the inhalation of a few drops of chloroform, or some other anæsthetic. And yet even this is deceptive in its supposed effects, for if the patient can breathe enough to take efficiently an anæsthetic into the lungs, he gets breath enough to quickly stop his paroxysm. It has the advantage of appearing to be doing something, and earns for the physician the confidence of the family, by having it appear that the use of the anæsthetic was quickly followed by a subsidence of the paroxysm itself. But while paroxysms of convulsions in children, especially those that we have now more particularly under consideration, not dependent upon uræmic poisoning or retention of any toxæmic agents in the blood, but dependent directly upon nervous excitability aggravated by some temporary exciting cause, quickly subside, the treatment for preventing their recurrence has two clear objects to be accomplished: one is the removal, as speedily and fully as possible, of whatever may have acted as a direct exciting cause of the convulsion. If there is actually a swollen and tender gum, it may be incised by a clear, straight cut across the top of the tooth, sufficient to completely sever the gum over the tooth. But in my experience I have found very few instances where the slightest evidence of swollen gums existed as the exciting cause of the convulsion. If there be gastric or

intestinal irritation or derangement from any cause, this should be carefully corrected as early as practicable. If the child be a little older, and subject to undue mental excitement, passions, or emotions of fear from injudicious management on the part of parents, or anything connected with the family itself, the physician should point it out and require it to be obviated. Thus, wherever the exciting cause can be traced it should be as accurately and fully removed as circumstances will permit. Having removed the exciting cause, the next and equally important object is to overcome the undue excitability of the nervous system, which constitutes the predisposition. This will often require close attention on the part of the practitioner and a full explanation to the parents, in order to secure the necessary attention for a sufficient length of time. The common tendency in all such cases is to regard the patients cured as soon as they cease to have convulsions and are able to take their usual food, and are free from immediate symptoms of disease. Consequently they become speedily careless about the administration of medicine, and the carrying out of good hygienic measures which may be essential for properly overcoming the constitutional morbid tendency. Therefore, to secure success in this part of the treatment, which often requires to be pursued for months or even for years, an intelligent explanation should be given to the parents and a proper course insisted upon. For permanent effect, great importance must be attached to the mode of living, including diet, exercise, clothing, even more than to the administration of medicines.

In a large proportion of this class of infants and especially young children after they have reached an age from two to five years, there is the greatest importance to be attached both to their mental and physical training. And first require the avoidance of all those mental influences which consist in encouraging periods of extreme excitement, either of hilarity, boisterous plays carried so far as to produce weariness and much vascular excitement on the one hand, and still more the avoidance of intense excitement of the passions, sudden fright, mental apprehension, that often are perpetuated almost from day to day by the indulgence on the part of parents and nurses of fretful and violent dispositions in their dealings with children, thereby begetting in the children themselves, equally violent dispositions and emotions; while the opposite kind of training, characterized by gentleness and kindness, if properly conducted, always serves to maintain better discipline than the most peremptory and violent commands. A very great influence can be exerted in overcoming the morbid nervous excitability in young children simply by proper mental influences in their management. For physical training, take them frequently in the open air riding, and when old enough to run about with any degree of freedom, walking and playing, varying the exercises so as to develop the chest and arms, as well as the legs, but avoiding all excesses or unduly protracted exercise. Another thing that is very generally overlooked, and yet of much importance to this class of subjects, is to secure for the patient, good, pure air during the night. Nothing tends more to debilitate, and at the same time increase the excitability of the nervous system, than sleeping in close, poorly ventilated rooms particularly if they are kept at an elevated temperature. Confined warm air without sufficient ventilation to prevent it from being contaminated by repeated inhalations, is one of the most injurious of all our domestic errors. There are many families in which the careful mothers, in their anxiety to prevent colds and protect their young children, keep them every night in an atmosphere that is absolutely impure during all the last half of the night, from want of change or ventilation. So far as the administration of med-

icine is concerned we can only lay down this general rule: that no medicine is required other than that which is frequently needed to properly regulate the secretions and evacuations, using such a combination as will produce a soothing, quieting and tonic effect. All so-called stimulants should be avoided. All nervous excitants, such as tea and coffee, should also be avoided or used very sparingly. It is very desirable to avoid the use of the opiate class of narcotics, not only because they tend to constipate and interfere with secretions, but on account of the fact that they speedily subject these nervously excitable patients to the impression which calls for their repetition, and the habit of taking them is general y induced. Temporary quiet is obtained in such cases at the expense of permanent and serious impairment of the tone of the nervous system. The bromides in connection with tonics, either of the bitter class, such as preparations of cinchona, or those more directly nutrient, as the hypophosphites, lactophosphates, and sometimes preparations of iron, will be found advantageous. But the particular remedy must be selected for each individual patient, and the dose adapted to the age, always remembering that to overcome a predisposition or constitutional tendency of any kind, requires time, patience and steady perseverance. And with these three qualities, time, patience, steadiness of purpose, with a reasonably judicious exercise of judgment in selecting the particular hygienic measures and remedial agents, almost all cases of the character we have been considering can be conducted to so full a recovery that on their arrival at puberty, or adult life, they will be free from the predispositions of childhood, or the defects of hereditary tendencies.

LECTURE LXXVI.

Hysteria—Its Varieties, Causes, Clinical History, Pathology, Diagnosis, Prognosis and Treatment.

GENTLEMEN: Hysteria is a name which has long been applied to certain conditions of the nervous system presenting symptoms more or less similar, and yet varying widely in different cases, and very generally regarded as limited to the female sex. Indeed, the name hysteria was chosen, not only because of the supposition that the disease was limited to the female sex, but that it was connected essentially with some disturbance or morbid condition of the uterus or ovaries. It is certain, however, that this idea of the restriction of the disease to one sex is erroneous. Although occurring much more frequently in females, cases of a well-marked character have been observed not very infrequently during the early period of adult life in the opposite sex. And even in females there is ample evidence that many cases presenting hysterical phenomena have no necessary connection with the uterus or with ovarian disorders. Indeed, it is probable that the latter class of disorders simply act as exciting influences, tending to aggravate the nervous affection, when there is already existing a predisposition to it, or an actual existence of the disease, and that the group of symptoms which are denominated hysterical, are in no way *necessarily* connected with the functions of the ovaries or uterus. It is a form of disease which has been known and described from a very early period of medical history, and is probably capable of

assuming a greater number of variations in its symptoms and immediate manifestations than any other disease to which the human system is liable. In one direction it has a close relationship to epilepsy, in another to certain forms of mental derangement, while the great majority of cases appear to consist almost exclusively in an excessive or morbid excitability of the cerebro-spinal system of nerves and nervous centers, coupled with a decided loss of balance, or co-ordination in the controlling functions of the cerebral hemispheres. As already stated, it occurs most frequently in the female sex and between the ages of fifteen and twenty-five years, though well-marked instances are occasionally observed at an earlier period, and of those that become subject to the disease during the period named, very many continue during the whole period of adult life. Very few cases, however, are observed in old age.

Causes.—I may say, the predisposing causes consist of almost any influence which is made to act continuously through considerable periods of time and of such a nature as to increase ordinary susceptibility of the nervous structures. The confinement of young persons, from ten to fifteen and twenty years of age, much in warm rooms, poorly ventilated—either in school-rooms, in their sleeping apartments, or any other establishment, and especially if such confinement is coupled with active mental training, or any circumstances that are calculated to produce frequent mental excitements, such as the reading of novels, exciting stories, or any writings that intensely occupy the mind of such persons, greatly favor the development of that peculiar morbid excitability which renders them ready subjects for hysterical paroxysms of excitement. The same predisposition to hysterical temperament is promoted by all those circumstances, in what is termed fashionable society, which lead the young into plays and amusements of such a nature as are calculated to produce strong emotions of any kind. The attendance upon theaters, balls, or occasions where they are kept till late at night in the midst of excitement, and usually high temperature of the air, may be enumerated as predisposing causes. Another unquestionable predisposing influence is that which may be denominated heredity. As an instance, there are families in which a well-marked hysterical development has been noticed from one generation to another, through several generations. Exciting causes of hysteria consist in many circumstances which are calculated to produce sudden and strong emotions, or passions of the mind. Often a most trifling disappointment in persons predisposed will throw them into the active exhibition of hysterical phenomena. Almost equally ready, also, will be the similar responses to emotions of a pleasant character, provided they are intense. The sudden reception of news of an exciting character, whether pleasant or unpleasant, and fright, will often produce the same results. Whenever, through hereditary influences or otherwise, a distinct hysterical temperament has been established, there is no doubt but that the occurrence of uterine congestion or disturbance tends to increase the predisposition, and to develop or induce active paroxysms of hysterical phenomena. In females of this class the menstrual period is almost always one in which more or less of the active hysterical symptoms are manifested. And in some of them almost every menstrual period will be ushered in by full hysterical convulsions. When the same temperament exists in the male, sexual excitement is liable to produce the same results as the menstrual period in the female. Such persons, indulging in sexual intercourse, or in self-abuse, will not infrequently develop directly the phenomena of active hysteria.

Symptoms.—To enumerate all the symptoms observed in the various

shades and forms of hysteria, would require more time and occupy more space than would be profitable or necessary. The essential feature which may be said to characterize all the phenomena belonging to the hysterical condition, is that of extremes, or the production of phenomena entirely out of proportion to the nature and intensity of the exciting cause. And, in addition, an entire want of steadiness or balance in the manifestations of phenomena. By this I mean the rapid changing from one extreme to another. The idea is best illustrated by the very common occurrence of passing from the most serious sobbing and crying in a few minutes to the most violent and uncontrollable laughter and hilarity. Such mental variations of passing from one extreme to another characterize all the phenomena, physical as well as mental. The motor apparatus may be disturbed in so erratic and variable a degree, that the patients at one hour claim to be powerless or incapable of motion, as though utterly paralyzed, and in ten or twenty minutes perhaps, are exhibiting the violence of physical effort and full strength, or a convulsion that would require one or two attendants to keep them in bed, or from doing themselves harm. Sensations are equally variable and pass to extremes. More generally hyperæsthesia, or claiming that the slightest touch is painful, often exhibiting excessive indications of pain, or suffering, from any touch or motion, and at other times obstinately claiming that there is no sensibility in the parts whatever.

The disturbance of the involuntary functions are also characterized by the same extremes, as illustrated in the secretions. In one instance the urinary secretion may appear to be entirely suppressed, until a few hours or even a day has passed by with no secretion, or if any, but a few drops, and yet without any of the serious consequences of suppression. Much more frequently, however, the opposite condition exists, and while under the influence of active hysterical phenomena the secretion is greatly increased, so that a large chamber vessel may be filled in a single night. In such cases the urine is limpid and almost like clear water, and of low specific gravity. The movements of the heart, and respiration, are less disturbed in hysteria than almost any of the other functions. There is often, however, very great oppression or distress in the chest, sometimes in the form of acute pain in the left breast, at a point over the phrenic nerve, where it reaches the diaphragm. This might lead the inexperienced to think that the patient had a pleuritic, or pericardial inflammatory attack. But a little scrutiny would show that it was wholly unaccompanied by fever, or any real disturbance of the circulation and respiration corresponding with inflammatory disease. But more frequently the sensation of oppression is in the form of a ball, or weight in the epigastric region, frequently rising up through the chest, creating the sensation of oppression, until it reaches the trachea, where it will appear like a ball, which they can neither get up nor force down by swallowing, but causes a sense of choking and suffocation. This choking sensation is unquestionably induced by the transmission of a morbid impression through the recurrent branches of the pneumogastric nerve. Diagnostically, it has been styled the *globus hystericus*. Many hysterical patients sit up the greater part of the night, from dread of choking or suffocating from this sensation in the neck or some point between the epigastrium and trachea. In what is called a hysterical fit, or full hysterical convulsion, the whole voluntary muscular system is thrown into violent clonic spasms, much resembling the full paroxysms of epilepsy. There are, however, these marked and reliable differences between the hysterical paroxysms and the convulsions of the epileptic. In the latter, the temperature rises distinctly above the nat-

ural standard, and consciousness is totally obliterated. But, in the hysterical convulsion, there is no rise of temperature, and it is also invariably the case that if the patient is put to the proper test it is found that consciousness is not entirely obliterated during any part of the time. Hence, it is more rare in the hysterical convulsion than in epilepsy, that the same kind of accumulation of phlegm in the fauces, or what is popularly styled "frothing at the mouth" and biting of the tongue occur. Neither is there the same uniform tendency on the part of the patient, when passing out of the paroxysm of a convulsion to have a period of apparent sleep as a sequel of the spasm. But the hysterical patient not only arouses much more readily and quickly, but also passes again quite as readily and quickly into another, with but a short interval in many cases, until a dozen or more have been encountered; and yet when they finally cease, there is not anything like the degree of exhaustion, and indication of serious impairment of cerebral function and sensibility that would be produced by even two paroxysms of epilepsy, occurring at short intervals of time.

Those subject to hysterical paroxysms, if even of frequent occurrence, present none of that tendency to impairment of the mental faculties, or permanent changes in the functions of the brain and cerebro-spinal centers, which are characteristic of well-marked and frequently recurring paroxysms of epilepsy. I may say then, in regard to symptoms of hysteria, that they consist in disturbances of the sensations and emotions, or mental phenomena, of almost every shape and variety of intensity and frequency of manifestation, from the simple choking in the neck, to the most violent clonic spasm. And mentally, changes from the most extreme depression and despondency to the highest degree of excitement and hilarity, follow each other in quick succession. Yet in all these variations and changes, they have left no impression of structural change or permanent impairment of function; consequently, a true hysterical patient may be afflicted for years with hardly any indications of permanent impairment, either of mental or physical functions.

Diagnosis.—The statements I have just made in regard to the general characteristics of the symptoms and phenomena of hysteria, point to the most reliable means of diagnosis. There are many phases of the disease in which a physician on first coming in contact with the patient might be unable at once to properly interpret. For instance, in reaching a patient in the midst of a violent hysterical convulsion, it might be impossible during the time of the convulsion to determine by the phenomena alone, without an accurate history of the patient, whether it was hysterical or epileptic. Yet, as soon as a history of the patient has been obtained, or time enough has elapsed to watch the patient through the paroxysms of the convulsion, and a few subsequent hours, it will rarely happen that the practitioner will not be able to detect clearly and distinctly those exaggerations, or want of balance alluded to in the phenomena that pass rapidly from one extreme to another in the mental and physical changes, and thereby readily distinguish this from all other affections. And it is on this careful study of the antecedents, as well as the present phenomena, that the physician must base his diagnosis, and not upon any one or two of their special symptoms.

Pathology.—From what I have already stated in regard to the causes and symptoms, you will infer that there are no anatomical changes in the nervous centers, or in any other portion of the system, that have been identified as characteristic of this form of disease. Indeed, it has seldom, if ever, terminated fatally without complication with other pathological conditions that are really the cause of death. And therefore it can hardly be said

that there have been opportunities, except very rarely, for studying the minute anatomy of the nervous centers, or any other portions of the system, of those who have died, subject to well-marked hysteria. While, however, there are no distinctive structural changes recognizable in any portion of the nervous centers as peculiar to this form of disease, it is undoubtedly true that the elementary properties of the nerve structures generally are materially altered from that of health, and more particularly, that property which I have styled elementary susceptibility. This exaltation of the elementary property gives to the nerve tissue of the hysterical subject its exaggerated response to impressions of almost every character. In some instances, undoubtedly, this morbidly susceptible condition of nerve tissue is restricted to a certain portion of the nervous system. The hysterical symptoms are consequently limited in their manifestations. For example, we see sometimes the symptoms limited to a single limb, or a particular portion of the body. In such cases it may take the form of hysterical paralysis, or some unaccountable, apparent affection of the joints, or of a single joint, or in the abdomen assuming the appearance of a tumor, constituting what is designated as *phantom tumor*, and which has sometimes so persistently simulated the existence of a tumor as to cause experienced surgeons to make preparation for operations, and only to be relieved from the deception when the patient was on the operating table and placed under the influence of an anæsthetic, so as to overcome all consciousness, when with the obliteration of the consciousness of the patient the tumor also disappeared. In other instances the morbid susceptibility may be limited to certain portions of the hemispheres apparently affecting more particularly the manifestations of certain emotions or functions of the mind. But in the greater number of cases with which you are liable to come in contact, the morbid susceptibility or impressibility of the nervous system will be universal. I see no other way to account for the want of balance, the ready and exaggerated response to impressions of almost every kind that can be given, than by this supposed exaltation of the primary susceptibility of the structures themselves. As I have stated in the beginning, the word hysteria indicates a relationship, necessarily, to the uterus and ovaries, and therefore is misleading. And, as the most prominent and uniform characteristic of the phenomena belonging to the disease is that of want of balance in the performance of nervous function, and the extremes of response to ordinary impressions, it would perhaps be better if the suggestion of Dr. Hartshorne was adopted, that instead of hysteria, the morbid conditions included under that head now, were transferred to neurataxia, indicating loss of balance in the functional action of the nervous centers.

Prognosis.—So far as relates to the question of danger to the patient's life, the prognosis in hysteria is uniformly favorable. It rarely, if ever, proves fatal. Regarding, however, the prospect of a permanent cure, the prognosis is less favorable. While many cases in the early stages of their progress, or even during the first few years after their development, can be entirely cured under favorable circumstances, there are others under less favorable conditions, in which palliation, and not cure, is the more frequent result of all the efforts that can be made, in the management of the patient.

Treatment.—The treatment of hysteria includes two objects: the one relates to immediate relief of the present distressing symptoms, and the other to the permanent removal of the causes and pathological conditions which give rise to, and constitute essentially, the disease. As almost all of the symptoms of sufficient degree of intensity to require special pallia-

tion consists either of spasmodic action in some portion of the muscular system, or the development of morbid sensations of an exaggerated character, the remedies for temporary relief are chiefly those denominated anti-spasmodics and sedatives to nervous excitability. For relieving most of the minor symptoms which may distress the patient and prevent rest at night, such as oppression in the chest, sensations of choking in the neck, sleeplessness, and various grades of mental excitability and hallucination, a combination of the bromide of ammonium with some preparation of valerian, scutalaria, or hyosciamus, or of the three combined in proper proportion will usually suffice for administration at the proper time, and in suitable doses. A prescription, consisting of fluid extract of valerian, sixty cubic centimeters (fl. ℥ ij), fluid extract of scutilaria forty-five cubic centimeters (fl. ℥ ij), fluid extract of hyosciamus fifteen cubic centimeters (fl. ʒ iv), and bromide of ammonium twenty grammes (ʒ v) may be given to a patient, between the ages of fifteen and twenty-five years, in doses of four cubic centimeters, (fl. ʒ j), diluted with a little additional sugar and water, early in the morning, at tea time and bed time.

In the cases to which I last alluded, it will seldom fail to relieve the morbid sensations, produce a degree of quiet during the day, and secure for them a fair degree of sleep during the night. Many times I have found that two doses, one at tea time and the other at bed time, were quite sufficient for accomplishing these purposes. Where the disease manifests itself in the form of neuralgic pains, whether in the left breast or in almost any other part of the system, valerianate of ammonium is one of the most efficient remedies that can be used, so far as my observation extends. This remedy, given in doses of from six to twelve centigrammes (gr. i to ij) three times a day will usually afford the desired relief. Where full convulsions occur the immediate administration of an enema, containing six decigrammes (gr. x) of assafœtida, and the same quantity of hydrate of chloral suspended in sixty cubic centimeters (fl. ℥ ii) of warm water or mucilage, and introduced into the rectum, will usually produce a prompt and decided degree of relief. As soon as the spasm has passed sufficiently to allow the patient to take remedies by the mouth, a gelatine-coated pill of three grains of assafœtida may be given, and repeated every two hours till the disposition to further convulsive movements cease. In such cases, where full convulsions occur, it is often justifiable also to apply sinapisms over the epigastrium and warmth to the extremities; and when the sinapisms have been applied until the skin is red, changing it to the central portion of the spine between the scapulæ, will also produce some influence in relieving the patient. I have mentioned the foregoing remedies simply as specimens, and to indicate to you the class of remedial agents that may be made useful for temporary purposes in relieving the various forms and shades of hysterical excitement and active phenomena. In the more protracted and severe cases, especially involving convulsions, chloroform and ether may be called into requisition temporarily. But so far as the cases can be managed without inducing direct anæsthesia on the one hand, and more particularly without the use of opiates on the other, it will be desirable to do so. There are no classes of patients that so readily become habituated to the use of either anæsthetics or opiates as the hysterical. And none are more difficult to relieve from the habit, especially of the use of opium, where they have once acquired it. And not only this, but opiates are objectionable in this class of patients, for the reason that while they may prove efficient in temporarily quieting the hysterical excitement, inducing rest and relieving spasms, they invariably produce more or less derangement of the digestive functions and

secretions, and pave the way for a return of the active symptoms of the disease more readily than though they had not been used. Consequently it is desirable always to avoid their use in this class of subjects as far as practicable, and my own experience has satisfied me that the cases in which they are strictly necessary are exceedingly rare. The same remarks apply to the use of the alcoholic class of anæsthetics, either fermented or distilled.

No class of subjects more readily become habituated to them, or claim that they relieve their varied and excessive exaggeration of nervous evils, than the hysterical. And yet, their effects are always temporary, never curative, and directly calculated to perpetuate the constitutional difficulty under which the patient labors. In regard to the other object of treatment, namely, the removal of the diathesis or constitutional tendency, or, in other words the removal of the disease, there are no specific remedies to be recommended. Each case must be studied by itself; the causes, predisposing and exciting, which influence the individual patient, must be accurately ascertained, and as far as possible they must be removed or avoided by removing the patient from their influence. Wherever special functional disturbances exist, such as indigestion, constipation of the bowels, suppression of the secretions of any kind, derangement of the uterine function, or menstruation, all of these must be noted and remedies employed appropriate for their removal. When, as far as practicable, the predisposing and exciting causes have been removed, and collateral disturbances that may act injuriously upon the patient in perpetuating the nervous derangements, are corrected, the remainder of the treatment will consist in procuring for the patient an abundance of pure air, moderate and regular systematic outdoor exercise, and above all the influence of steady, pleasant mental occupation. Something to do every day, and something which will actually engage the thought and attention, as well as absorb the time of the patient, is of paramount importance. There is no obstacle in the way of the cure of these patients greater than that of idleness or want of occupation. And no part of the management is more difficult in many cases than supplying such occupation as is needed. But plain, unstimulating diet, good air, warm clothing during the cold seasons of the year, careful attention to the digestive function, and regular pleasant occupation of the mind, will cause almost any hysterical subject to obtain permanent relief from her difficulties. A considerable number of these patients present a moderate degree of anæmia or slight impoverishment of the blood, and will be benefited by the protracted use of moderate doses of iron, combined with the milder class of anodynes. A combination of citrate of iron and hyosciamus, thirteen centigrammes (gr. ii) of the former and six (gr. i) of the latter, put up in the form of a gelatine-coated pill or capsule to render it pleasant for the patient to take, may be given at each meal time. This remedy will often do much to improve the general tone of health, and consequently lessen any undue susceptibility of the nervous system. If the patient lives in a malarious district, and has been more or less subject to the impairing influence of that agent, six centigrammes (gr. i) of quinine or cinchonidia may be properly added to the pill of iron and hyosciamus. But it is useless to specify particular tonics, for if you see clearly the objects to be accomplished, namely, that of holding a steady, moderate, quieting influence over pure excitability on the one hand, and promoting a more active development of blood corpuscles and efficiency of nutrition upon the other, you can easily select from the materia medica an ample supply of those agents which will be calculated to fulfill these indications. What-

ever agent is used, however, should be given in moderate doses with the expectation of continuing it through a considerable period of time. The administration of medicine of any kind should never cause the physician or patient to lose sight of the value and necessity of occupation, outdoor air and the avoidance of extreme excitement in all the relations of life.

Hystero-epilepsy.—A class of cases that recently attracted much attention, chiefly through the investigations of Charcot and others in Paris, may be styled hystero-epilepsy, or a combination of the phenomena of hysteria and epilepsy in the same person. Thus far, all the cases that have been presented of this particular class are females, usually in the early period of adult life. Some of them have exhibited very remarkable phenomena in varying from the occurrence at irregular intervals of slight muscular rigidity, sometimes accompanied by increased sensibility or hyperæsthesia, and at others by anæthesia, or loss of sensibility, to the most violent convulsions. The phenomena are sometimes limited to particular parts as one limb or one half of the body, and at others, involving the whole muscular system. In any stage of the progress in these cases even coincident with the convulsive paroxysm, there are presented the most remarkable emotional manifestations and the assumption of the most grotesque and ludicrous attitudes. Some of these cases have been studied and exhibited in the clinics of Charcot, and have attracted a great deal of attention. The point of most interest, however, connected with them is the apparent demonstration of the relationship between the ovaries and the manifestation of the general symptoms. Several of the cases that have been exhibited in the clinics, and some that have been studied elsewhere, were found capable of manifesting muscular rigidity, and passing through all the stages that I have just alluded to by simply making light pressure over one or both ovaries.

And yet, firm and strong pressure over those parts would pretty generally arrest the further progress of the paroxysms. So much so indeed, that pressure upon the ovaries has been proposed as a temporary mode of relief, and the extirpation of these parts suggested as a permanent means of cure. A study of these cases has brought out phenomena so striking, and in some instances bearing such close resemblance to the nervous affections that have occasionally appeared like epidemics in connection with high religious excitement in the past three centuries, both in Europe and in this country, that they have been considered as affording an explanation of the phenomena that were manifested on those occasions. Aside from the local treatment relating to the ovaries, these cases require to be managed upon the same principle that we have already mentioned in regard to hysteria in general.

LECTURE LXXVII.

Insomnia and Neuralgia—Their Varieties, Causes, Clinical History, Pathology, Diagnosis, Prognosis, and Treatment.

GENTLEMEN: By insomnia is meant inability to sleep. If not a distinct disease it is a morbid condition of not very infrequent occurrence and may originate from a variety of causes. From the most recent and careful investigations it would seem that the condition of sleep

is one in which there is less fullness of the arterial circulation in the brain, a state of less activity of the circulation in the arterioles, while that of wakefulness and insomnia pathologically is the opposite. In the latter condition, from some cause the arterioles remain excited and maintain a morbidly increased activity of circulation, fullness of blood, or a state of erethism, as it has been termed by some. This condition is capable of being produced by prolonged and intense mental application, perhaps, still more rapidly by intensity of mental emotions, whether depressing or exalting, also by apprehension, anxiety, particularly in reference to business concerns, or too great a variety of important objects to be attended to, so that the mind is over-burdened. These are among the most common causes of insomnia. The first, or protracted mental application, is the one most frequent among students and literary men. That dependent upon mental apprehension and intensity of thought, or anxiety about results is most apt to be the one affecting business men. But all classes of individuals, male and female, are liable to encounter such mental conditions, and be involved in such circumstances as may lead to this condition of undue cerebral excitement or erethism in the brain. There are some agents in common use that are capable of producing the same condition. Of these, strong tea and coffee are among the most common, and there are thousands, especially in the female community, and even among servants in our houses, who by the habitual use of strong tea create a condition of insomnia coupled with disturbance of the functions of the pneumogastric and cardiac nerves, that prevents sleep night after night, sometimes for months, until the general health is much impaired. A somewhat similar condition, though differing a little in its phenomena, is sometimes induced by the excessive use of tobacco. Alcohol, by its excessive and protracted use produces insomnia, but the phenomena are connected with other symptoms so as to distinguish it from the ordinary cases and give it such characteristics as have been described as *delirium tremens*, or *mania potu*. The disease to which I now allude is not one of delirium, however, nor one of mental derangement in any sense, but simple inability to sleep. Sometimes, though not frequently, extreme exhaustion from over-exertion may produce this condition, but if so it is rare. If insomnia depends upon the condition to which I have just alluded, and may arise from the causes enumerated and others acting in a similar direction, it is not difficult to select the remedies that may be most efficient for relieving the difficulty.

Treatment.—The first and most important item in the treatment is the removal of the cause, or suspension of its further action whatever it may be. If the use of tea, coffee or tobacco in excessive quantities has been the exciting cause, it must be discontinued. If intense mental exercise, protracted mental application, or an excess of business cares excites apprehension, little can be expected in the way of success in relieving the patient without mitigating or removing the action of these causes. And the patient must be informed that a change which will relieve him of all excess in any and all of these directions is an absolute necessity for obtaining the relief that he desires.

The same rule will apply to the removal of any and every variety of cause that might be of influence in developing the disease. There is a great temptation to neglect this in many of these cases, especially as they occur among men largely engaged in business or intently occupied in literary pursuits who, by administering palliatives, endeavor to palliate the morbid condition, while allowing the cause to continue. The claim is that the patient must accomplish this or that task or object, and that relief

must be procured by agencies that will overwhelm the effects of the exciting cause. All such cases present a strong motive for using anodynes and anæsthetics of the stronger class, which by their use always endanger developing a condition of the nervous system far more injurious than the one they are endeavoring to palliate. It happens in many of these cases that either by the recommendation of the physician or from the previous knowledge of the patient himself, but more frequently from the advice of some of his neighbors, he commences to procure sleep by taking a certain amount of alcoholic drink every night. In mild cases it will be a glass or mug of beer, ale or porter. In cases of greater severity, whisky sling or punch will be called into requisition, and under these they will claim to sleep. There are large numbers of those who commence to palliate the effects of injurious mental exercise and surrounding circumstances by using these agents, at first, simply for the purpose of procuring sleep. But they soon create that condition of the system by which they are induced to use them more and more frequently, until before they are aware of it they have become completely enslaved by the alcoholic anæsthetic. After acquiring this condition it is more difficult to cure by far than the original disease. If instead of alcoholic anæsthesia, they have assayed to palliate their symptoms and enforce sleep by any of the opiate preparations, they have generally ended in the development of the opium habit which, though not so destructive in other respects, is more difficult to eradicate than the alcoholic enslavement. The physician can not be too guarded against allowing this class of patients to enter upon the use of either the alcoholic or opiate preparations. It is the imperative duty of the physician in all these cases, instead of yielding to the use of such agents for the purpose of allowing the patients to continue the operation of the causes which have impaired their ability to sleep, to require the immediate removal of the latter. He may afford such aid as can be done without resorting to injurious medication, or such as will endanger the development of morbid appetites and injurious habits. In my own experience I have encountered no insuperable obstacles in carrying out the measures which I have just now recommended. Patients will seldom be found so obstinate or blind to their own interests that they will not make the necessary changes in their business and habits, if the physician clearly explains the tendency and causes of their trouble and familiarly points out to them the necessity for modifying and removing them.

Nineteen twentieths of all cases of insomnia, if the causes are avoided, will readily yield to the use of a moderate amount of any one of the bromides, either alone or in conjunction with digitalis. From six to thirteen decigrammes (gr. x to xx) of the bromide of potassium or ammonium, with the same number of minims of the tincture of digitalis, for an adult, administered from half to three quarters of an hour before the patient desires to go to sleep, will produce the desired effect, and obtain comfortable sleep at night. In cases of more obstinacy, the dose I have just spoken of administered about seven o'clock in the evening, and repeated at nine or half-past nine, thus making two doses in the evening, will rarely fail to procure the desired sleep. Chloral is often resorted to, but after a fair trial, I have abandoned its use in this class of patients from the fact that very many of them, while they sleep during the night, and especially during the latter part of the night, or even until late in the morning, continue to feel during most of the following day, a dull, stupefying effect upon their mental faculties that is not pleasant. And sometimes they exhibit a degree of dullness amounting to an incapacity to attend to any business even of the lightest character. This tendency

to perpetuate the dull, stupefied condition of the cerebral function during the following day, renders the use of chloral less desirable than the bromides, and so far as I have been able to observe it is not in any degree more efficient. In some few instances I have known at first, until a partial recovery had taken place, a combination of the bromide and chloral to do better than chloral alone. As you will perceive also, I usually give a dose of digitalis in connection with the bromides. Direct clinical observation, first in the treatment of delirium tremens, has led me to regard digitalis as possessing much efficacy in diminishing that peculiar erethism, or morbid excitability of the brain which prevents sleep, more particularly in that class of cases where the general condition is one of impairment, not of anæmia proper, but where the pulse is rather quick and irregular, with undue nervous excitability in addition to wakefulness. In all this class of cases, the influence of digitalis in giving more steadiness, slowness and uniformity to the heart's action, renders it an advantageous agent, and aids very much the more purely sedative effect of the bromides upon nervous excitability, and contributes largely to the recovery and re-establishment, permanently, of a more normal condition of the circulation than could be obtained without its use. It is probable that the fluid extracts of cactus grandiflora, and of convallaria would produce effects very similar to those that are obtained from digitalis. In some instances, also, valerian combined with the bromides will contribute decidedly, not only in the production of sleep during the night, but by a pleasant tonic influence upon the nervous system contribute much in establishing its proper tone. It is unnecessary to say that in all these cases, in addition to remedying the causes that have operated injuriously upon the mind, attention should also be given to the physical functions of the patient. Constipation should be obviated, indigestion should be mitigated, and attention should be given to the natural condition of all the functions of the body, as well as the removal of such causes as might be already more especially disturbing the functions of the brain. A few words more in regard to another subject—*night terrors*. I allude to cases which are met with more particularly in children and youth, in which they become subject, not every night, but often, to starting suddenly in their sleep, as if greatly terrified. More generally, it occurs during the first sleep after retiring to bed. The child has been placed in bed, falls asleep quietly, apparently in good health, and in from one to two hours, suddenly starts up, looking wild and anxious, crying out for its mother or its attendant, as if in extreme terror; the shrieking may be for something to go away, as if in immediate danger of some terrible infliction. After the mother or attendant comes to its rescue, it pays no heed to her, but continues the same phenomena, exhibiting the most intense excitement and fear both in its utterances and in its motions. Notwithstanding the shrieks and cries, the child is still asleep while in the midst of these terrors. Cases are occasionally met with in which these night terrors occur so frequently that they seriously disturb the child's sleep; and it becomes peevish habitually and more or less nervous or excitable, constituting an appreciable impairment of the general health, besides being a source of great anxiety to the family in which it belongs. The treatment required in such cases consists, first, in the adoption of some means for arousing the patient from his condition of terror, and secondly, in preventing its recurrence. The first is generally most easily effected by the simple process of immediately bathing the child's face with a cloth wet with cold water. The application of a cold, wet cloth over the face and forehead quickly arouses it from the condition of terror to one of wakefulness. The

moment it is thus aroused, it looks about, recognizes its friends and then generally resumes its attitude for rest, and in a few minutes is again asleep. There are some instances in which these terrors will come several times during the same night, but more frequently they occur but once, the patient often going to sleep the second time, and sleeping quietly through the remaining part of the night. The treatment for preventing their recurrence must depend upon a careful examination of the patient with a view to determining the cause or causes from which this condition may come. Sometimes it is taking food too late, and retiring with food undigested in the stomach. Sometimes it may be attributable to excesses in exercise of some kind during the day, especially in the latter part of the day; or it may arise from excessive mental exercise, or the indulgence of intense emotions and passions. A careful examination into the temper and habits of such children will often enable the physician to see more clearly the causes which exercise a disturbing influence over the functions of the brain during sleep, and by immediate removal of these causes there will be little else required to procure exemption from a return of the attacks.

But where the causes are not fully apparent, where the functions of the body are well performed, and there is no appreciable error in the mental influences that bear upon the patient, and still these paroxysms take place, it indicates a morbid state of the brain in which sleep develops into one of only partial inactivity accompanied by a constant tendency to frightful dreams, which give character to the special phenomena of such attacks. The remedies that are most likely to succeed in preventing such attacks are the same I have spoken of as being the most successful in cases of insomnia; that is the bromides and digitalis, or the bromides with valerian. Either of these combinations given in doses calculated to produce a decidedly quieting effect, a little before the patient goes to sleep, will usually secure exemption from the periods of excitement and dreaming till the tendency is finally eradicated. While I think the combinations I have just mentioned are the best, they are by no means the only ones that may be used. Chloral hydrate, hyoscyamus and camphor, either separate or combined, will generally produce the desired result, more especially if attention is given at the same time to keeping the various functions of the body in order, and to the proper regulation of the diet and exercise of the patient during the day.

Neuralgia.—Neuralgia, by which is meant pain in a nerve, is one of the most common affections the physician is called upon to treat. It may occur in any of the nerves of sensation derived from the spinal cord or brain, but is perhaps most frequent and troublesome, and consequently most likely to call for the attention of the physician, in the nerves of the face, sometimes taking the form of what has been styled *tic douloureux*, in the sciatic nerve, called sciatica, in the phrenic and intercostal nerves, generally called pleuro-dynia, and in the nerves of the stomach, called gastrodynia or gastralgia. These are names derived merely from the nerves in which the pain makes its appearance, and not from any differences in the nature of the affection. Neuralgia as distinguished from the pain produced by inflammation, either in the nerves or in the nervous centers, may be referred to three pathological conditions: one, in which the morbid sensitiveness is developed in the nerve itself or in the fibrous sheath directly surrounding the nerve matter; another consists in a morbid condition developed in the nervous centers, either in the spinal cord or brain, the manifestation being shown in the peripheral extremity of one or more nerves; and the third pathological condition favorable for causing

neuralgic pains, is an impoverished or spanæmic condition of the blood, or the presence in that fluid of some toxæmic ingredients derived from without. The first of these pathological conditions, namely, that relating to the nerve, or its sheath, most frequently consists of an inflammatory condition of the sheath arising from exposure to cold and wet, closely akin to rheumatic irritation, causing the sheath of the nerve to be more vascular, and consequently making pressure on the nerve matter, inducing pains which are denominated neuralgic. The same effects may be produced by the pressure of tumors in the course of a nerve, or by thickening of the periosteum in the bony orifices through which nerves pass in emerging from the spinal canal or cavity of the cranium.

In all such cases the neuralgia is characterized by being uniformly manifest in the same nerve and its branches, instead of radiating in different nerves. Familiar illustrations of this variety of neuralgia are found in the thickening of the periosteum and sheaths of the nerves of the face as they make exit from the different orifices, especially in the patients that are laboring under constitutional syphilitic difficulty, as well as those which may be accompanied by chronic rheumatic affections of the same tissue. Another very common example is sciatica, by which is generally meant a painful affection of the sciatic nerve, induced in most cases by rheumatic inflammation, affecting the sheath of the nerve and the fibrous tissue, at the orifices through which the roots of the nerve emerge from the spinal cord. The second class of cases of neuralgia are those which depend upon some influence in the nervous centers, and the pain is seldom restricted to a single nerve or its branches, but is found to radiate through a number of nerves, having origin or connection with the same portions of the nervous center, but distributed, perhaps, in different directions. Wherever the neuralgic pains thus vary from one nerve to another, either in the trunks of the nerve or in the branches derived from different nerves in quick succession or simultaneously, it is evident that there is either primary or reflex irritation established in the nervous centers to which those nerves belong. The third class, or those which are dependent on the condition of the blood or the action of some toxæmic agent in that fluid, differ from both the preceding in the pains being felt sometimes in one part and sometimes in another, until almost every sentient nerve will be found to be in turn more or less affected. The pains are usually of very short duration at any one point, but are frequently repeated and generally very acute while they last. Familiar examples of this variety of neuralgia are found in patients subject to gout or rheumatic gout, not infrequently from the influence of malaria in impoverishing the blood.

Diagnosis.—Diagnostic features of neuralgia, by which it is to be distinguished from the pains dependent either upon the febrile conditions or local inflammations, are chiefly, the sudden development of the pain, its equally sudden disappearance, usually, entirely unaccompanied by any constitutional disturbance, either of increased temperature or disturbed circulation and in the interval between the paroxysms of pain, almost entire exemption from tenderness or increased sensitiveness of the part affected, although increased sensitiveness of the part is often present during the attacks of pain. There are different degrees of severity in neuralgic pains. Some are slight and momentary, others are sharp twinging or pricking; and still others so excruciating, piercing, and severe, as to cause the most agonizing suffering of which we can conceive. While they vary thus in the degree of severity, their most characteristic feature is suddenness of development and equally sudden disappearance; they are always paroxysmal, never continuous beyond a very brief period of time without interruption.

Pathology.—In speaking of the causes which may give rise to neuralgia, I intimated at the same time, the essential pathological conditions. Perhaps, in the nerve itself, it may be said that the essential pathological condition is an exaltation of the susceptibility of the nerve structure. There are no changes of such a character as to be perceptible or recognizable in the arrangement of the nerve cells, or the intricate structure of the nerve matter, which can be said to be characteristic of neuralgia. But the disease appears to be purely of a functional nature, not necessarily accompanied by structural changes. As I have just remarked, it consists in the development of a morbid degree of susceptibility, sometimes accompanied by pressure from congestion, thickening or induration of some portion of the nerve sheath or connective tissue surrounding the nerve. In such cases the continued pressure on the nerve tissue sometimes, if of long duration, results in atrophy, or wasting of the nerve cells, and increase or sclerosis of the connective tissue in which the nerves are contained, constituting a true sclerosis of the nerve cord. Those cases of neuralgia which are not traceable to local conditions relating to individual nerves, but are manifestly derived from some morbid condition of the nervous centers, often afford no indications of structural change that can be identified as a cause of the neuralgic difficulty. The same is true to an equal extent in regard to those neuralgias that are dependent on changes in the condition of the blood.

Treatment.—From the brief review I have given of the nature, symptoms and causes of neuralgia, you will have inferred that no method of treatment can be recommended as applicable to the cure or removal of all cases indiscriminately. But every case must be treated in accordance with the indications it may afford on careful examination in reference to the causes and pathological conditions which give rise to it. It may, indeed, be said that the object in the treatment of neuralgia is two-fold: one simply to mitigate pain, and consequently the suffering of the patient, for temporary relief; the other curative, or having for its object the removal of the causes and pathological conditions giving rise to the pain. The first may be accomplished by almost any efficient anodyne or anæsthetic; but the effect is temporary, and only relieves the patient while the anodyne or anæsthetic effect is maintained, unless other measures are adopted simultaneously for removing the cause. It is not desirable that patients become accustomed habitually to the use of opiates and anæsthetics for the temporary relief of their sufferings, so long as it is possible by any form of treatment to remove the cause; for, once habituated to the influence of these agents, they become a serious injury to the patient's health and happiness, and sometimes create a morbid condition of the nervous system, more difficult to eradicate than the original disease. My own observation has shown that a considerable proportion of those who become habitual opium eaters, or users of large quantities of morphine, have commenced, and gradually developed their habit for the purpose of relieving some form of neuralgia, or temporarily mitigating some painful affection that should have been relieved in some other way. Consequently, while chloroform, and other anæsthetics, morphine, and especially morphine and atropine combined and used hypodermically, may be resorted to for promptly relieving neuralgic pains of unusual degrees of intensity, yet I am satisfied that it is better to dispense with such remedies as early and to as great a degree as can be done and allow the patient to get any reasonable degree of rest during the time that the more curative treatment is carried out. The curative measures must, of course, depend upon the pathological condition giving rise to the neuralgic disease. Where

the fault is in the condition of the blood, either by the retention of toxæmic and irritating ingredients, as in gout, rheumatism, malaria, or various other agents capable of acting through the blood upon the nervous system, the remedies chosen must be such as are known to be most efficient in removing these agents, and these, I have already pointed out to you when speaking of the treatment of gout, especially neuralgic gout, rheumatic gout, and in the treatment of malarious fevers, and their various sequelæ; consequently it is not necessary to re-enumerate the remedies for these purposes at this time. Many cases of neuralgia that are dependent upon malarious influences coupled with impoverishment of the blood have a strict periodicity, almost as much as the ordinary paroxysms of intermittent fever; coming at stated times in the day, and sometimes every second or third day, but without the accompaniment of fever or chills. All such cases require the efficient use of quinine or other reliable antiperiodics. At the same time due attention should be given to the use of such tonics or nutrients as will most efficiently promote the formation of red corpuscles, and the restoration of a healthy condition of the blood. Those cases of neuralgia dependent upon a morbid condition affecting the nervous centers, either in the spinal cord or in the brain, can be removed only by removing the central pathological conditions. Sometimes these consist in the development of tumors, pressing upon some portion of the brain; hæmatoma, induced in advanced life, in connection with pachy-meningitis; and not infrequently those changes caused by constitutional syphilis, either in the production of thickening of the dura-mater, causing pressure upon the brain or spinal cord of the same nature with thickening of the periosteum or the bones of the extremities, or by the degenerative change styled syphiloma, affecting the nerve structures. All these are conditions capable of giving rise to the most annoying and protracted neuralgic affections, such as hemicrania or migraine, facial neuralgias, sometimes severe neuralgic pains in the arms, especially near the insertion of the deltoid muscles, and occasionally radiating through the pneumogastric, as far as the stomach, causing violent paroxysms of gastrodynia. One case came under my own observation within the last two or three years, in which an adult, in the early period of life, had suffered for a number of years with the most severe neuralgic pains usually affecting the nerves of the head, the posterior muscles of one side of his neck extending down to the shoulders as far as the insertion of the deltoid at times, and which in its later stages became associated with more or less paralysis and with temporary turns of unconsciousness, usually not lasting more than a few hours at a time. This patient ultimately died under well-marked symptoms of cerebral disease, and the post mortem revealed a tumor, evidently originating from the dura-mater imbedded in the posterior lobe of the left hemisphere of the brain, fully two inches in diameter and in structure presenting all the appearances of a sarcoma. Of course when neuralgia, either alone or complicated, depends upon such structural changes as are in themselves incurable, no amount of treatment will do more than palliate the suffering of the patient, until a fatal result is reached. If you study closely the general diathesis of the patient, the influences, hereditary or otherwise, which may have existed, and capable of leading to deteriorative changes in some portions of the nervous system, you will generally be able to comprehend clearly the nature of the case you have to treat; and in those that are capable of removal, to adopt such treatment as will be successful in accomplishing that result. Of course, in those subject to constitutional syphilis, or to tubercular disease, the course of treatment must be guided by the nature of the

pathological changes belonging to each case. These have already been discussed when speaking of the various constitutional diseases. The form of neuralgia which is most common and most amenable to judicious treatment is that which depends upon some pathological condition relating directly to the nerve in which the pain is located. Yet such of these as depend on a permanent thickening of the dura-mater or of periosteum in the orifices of bone through which the nerve trunks pass, or on indurations that have become permanent in the sheath of the nerve, are incurable unless some operative procedure can be brought to bear, such as removal of a section of the nerve on the central side of the point of pressure or disturbance, which is sometimes not practicable. In those dependent on syphilitic, rheumatic or gouty influences, the treatment usually available for the removal of the constitutional affections, if adopted and pursued steadily through a considerable period of time will afford the patient relief. In several cases, both of hemicrania and facial neuralgia, which had existed for a long period of time and had been regarded as incurable, I found the patients to recover permanently by causing them to use steadily through several weeks of time a combination of the iodide of sodium and bichloride of mercury with conium in moderate doses, but persistently three times a day, in the same manner as for treating syphilitic nodes on any of the exterior portions of the extremities or cranium. By pursuing such a course, on the supposition that the difficulty was a thickening of the sheath of the nerves, or at the point of their exit from the cranium or spine, such supposed thickening has disappeared, or, at least, the neuralgias have been cured, and the patients in all respects improved in their health and physical condition. In a word, then, the curative treatment of neuralgia consists in ferreting out as accurately as possible the pathological condition on which it depends, and adjusting the use of remedies in each individual case to the removal of such condition, whether in the blood, in the nervous centers or in some portion of the individual nerve in which the pain is located.

LECTURE LXXVIII.

Tetanus—Its Causes, Clinical History, Pathology, Diagnosis, Prognosis and Treatment.

GENTLEMEN: The next subject to which I will direct your attention is one much less common, but far more destructive in its effects, when it does occur, than that which has just occupied your attention. Tetanus is a disease affecting the nervous system, which has been known and described since a remote period in the history of medicine. It consists essentially in such a pathological condition of some portion of the nervous centers, generally in the spinal cord, as will induce continuous, rigid muscular contraction accompanied by exacerbations of greater intensity, during which there is not infrequently clonic spasms. But the characteristic feature of the disease is continued rigid muscular contraction, with more or less intensity of pain. In the great majority of cases the first indications of the disease are felt in the muscles that move the lower jaw, causing that degree of rigidity of the temporal and masseter muscles, and sometimes other muscles of the neck, that renders it difficult and painful

to open the mouth; and when the disease is fairly developed, rendering it, in most cases, impossible for the patient to open the mouth or separate the teeth far enough to allow the taking of even liquids without much difficulty. In most cases, soon after the rigidity of the muscles of the jaws has made its appearance, a similar degree of rigidity begins in the muscles of the back of the neck and along each side of the spines of the vertebræ. From the first, it is difficult for the patient to bend his neck or turn his head, and soon the contractions of the dorsal muscles draw the head backward and bend the whole body, making it convex anteriorly and curved or concave along the spine. This rigid contraction curving the spine backward, causes great pain to the patient, particularly through the direction of the diaphragm, the chest and the epigastrium, but more especially directly through the central portion of the body in the line of the diaphragm. The tetanic contraction of the muscles is continuous, allowing no positive relaxation at any period of time during the progress of the disease. But while there is constant rigidity or contraction there are also frequent paroxysms of still greater contraction of a temporary character, constituting paroxysms of spasmodic action in which, sometimes, all the voluntary muscles are called into action and may be more or less rigid. The patient is placed in extreme suffering, it being difficult for him to obtain breath, and causing the tension and tightness through the central portion of the body to be extremely distressing.

In the mean time while this peculiar muscular rigidity, manifested mostly in the muscles of the jaws and along the spine, continues, with the intervention every few minutes of more decided cramps and distress, the disturbances of temperature and circulation are only moderate. The temperature rises but little above the natural standard in the great majority of cases; the pulse usually becomes moderately increased in frequency, rather soft and weak, the extremities cool, lips looking a little dry, the countenance anxious in its expression, deglutition more or less difficult, respiration rendered inefficient and unsteady on account of the frequent spasmodic contractions of the diaphragm and thoracic muscles, but the discharge of urine and fæces often continues nearly natural. The symptoms I have described are such as characterize the great majority of cases during the first three or four days after the development of the disease. If no relief is obtained during that time, the patient's strength begins to fail somewhat rapidly, the pulse becomes small and frequent, the mind sometimes wandering, the extremities become cold, bluish, the spasmodic paroxysms increase in frequency and severity, sometimes bending the body backward almost into a half circle and creating the most intense distress at the epigastrium, almost entire inability to perform the act of deglutition, involuntary discharges, particularly at times during the violent spasmodic paroxysms, and in two or three days more complete exhaustion and death supervene. Cases of a little more moderate character may continue from nine to fourteen days and yet prove fatal from exhaustion. Perhaps a majority of cases of tetanus of every variety terminate fatally between seven and nine days. Occasionally a case is met with especially of traumatic origin which will run a more protracted course, the tetanic rigidity being limited mostly to the muscles of the face and jaws, back of the neck and upper part of the trunk. Being less violent in its nature or in its course, the patient does not become exhausted to a fatal degree until the end of three, four and even six weeks. Cases of that duration are, however, very rare.

Anatomical Changes.—In the large majority of cases in which post-mortem examinations have been made, no lesions of structure visible to

the unassisted eye have been detected in the spinal cord or brain, which could be considered as constituting an essential part of the tetanic disease. A few of those who have had opportunity to make post-mortem examinations and have carried these examinations to a microscopic minuteness, have found traces of sclerosis in some portions of the spinal cord and medulla oblongata. This has led them to regard the disease as essentially inflammatory in its nature, and akin to other affections involving sclerosis or hypertrophy of the connective tissue of the cord, with wasting and impairment of the nerve cells. And it is probable that in many of the cases of traumatic tetanus in which the disease runs a protracted course, minute examination would show some degree of the structural changes which are included in the word sclerosis, in the spinal cord.

These changes, however, are undoubtedly the result of the continuance of the disease through several days. The absence of any other characteristic structural changes in the cerebro-spinal nervous centers leads to the supposition that tetanus, like some of the neuralgic conditions, is dependent essentially upon the development of an exaggerated or morbid degree of the elementary susceptibility of the nerve tissue; in other words, the alteration of the properties inherent in the nerve matter, rather than any appreciable alteration in the arrangement of atoms constituting the structure. In reference to the etiology of tetanus, the cases met with in practice are divisible into three classes.

Causes.—The first are such as have been styled idiopathic tetanus and have usually been attributed to the effects of cold and damp air. But if it be true that they are caused by exposure to cold and damp air, it is proper to presume that the checking of eliminations causes retention in the blood of such elements as prove directly irritative, or capable of exalting the properties of the nerve matter of the cord, and consequently inducing tetanic contraction of the muscles to which the spinal nerves are distributed. Another class of cases much larger than that just alluded to are called traumatic, because they are traceable, more or less directly, to injuries or to the effects of surgical operations. Wounds of a penetrating and lacerating character are much more liable to give rise to tetanus than the incised or cleanly cut wounds. Many cases have originated from very trifling, penetrating wounds. The insertion of a needle or pin into the palm of the hand or bottom of the foot and sometimes in other portions of the surface have been sufficient to act as exciting causes of the disease. But much more frequently the disease is caused by such injuries as the penetration of a nail into the bottom of the foot by stepping upon it or upon any sharp substance, whether metal or wood. But any lacerating or penetrating wound or the performance of any surgical operation by which nerves or their sheaths are injured, may, in the progress of the case, transmit such an influence to the spinal centers as to develop tetanic rigidity of the muscles and all the phenomena and results ascribed to tetanus. How wounds or injuries produce the morbid action which we see in these cases is not easy to explain. Whether it is wounding of nerves at the point of injury causing inflammation in the nerve matter and the transmission of the irritative influence to the spinal center, or whether in all such cases there is generated in the wound some poisonous or septic material that is transmitted along the nerve matter to the central portion, or through the blood like other septic poisons, is difficult to determine. The *modus operandi* by which traumatic tetanus is produced, has never been satisfactorily explained. To say it is a reflex irritation in the spinal cord from some point of the periphery of the sentient

nerves is simply stating the fact rather than giving an explanation. The third variety of tetanus, that which occurs in young children or infants, is called *trismus nascentium*. It is usually manifested during the first two weeks after birth, sometimes in two or three days. In some countries tetanus in young children is of frequent occurrence. Such is the case in Iceland and the Hebrides islands. It is most apt to occur in the infants that are born in the over-crowded tenement houses or in the midst of bad sanitary conditions. Although met with occasionally, it certainly is not of frequent occurrence in our own country, and especially in this city. For in a busy, general practice of many years here, with a due proportion of attendance upon both mothers and their infants, I have met with no cases, except two or three, to which I have been called in consultation occurring in the practice of others. Some writers have attributed the occurrence of tetanus in infants to the condition of the umbilicus while healing, after the separation of the cord, in the same manner as they refer the disease occurring in the adult during the progress of wounds or injuries of various kinds. But the disease has shown itself in some infants after the wound left from severing the cord had entirely healed, and consequently could have had no possible influence in producing it. One writer has attributed the occurrence of tetanus in infants to the continuance of the pressure of the occipital bone upon the posterior part of the brain. During severe and protracted labor with average pressure upon the child's head, there is always a pressing in of the occipital bone, while the parietal juts beyond or overlaps it. And if no care is taken to keep the child upon its side and it is allowed to rest the back of the head upon the arm of the nurse or on the pillow, when lying, this depression sometimes does not become restored during the next day or two after birth, but remains and produces an injurious effect upon the functions of the brain. I have known several instances of this kind where the effect was such as to produce a constant peevish restlessness; a ravenous desire for nursing as if it felt an unusual appetite, and yet the growth of the child by nutrition, generally appears to be entirely suspended. Some instances of this kind I have known to continue for three months after birth. The discharges from the bowels were constantly more frequent than natural and very variable in color, with rapid emaciation and very little tendency to sleep in any part of the twenty-four hours.

And yet, when the depressed condition of the occipital bone was detected, the child placed so as to rest the head upon the parietal protuberances, leaving the occipital and frontal regions entirely free from pressure, a few weeks have sufficed to cause the occipital bone to resume its position on a level with the bones it joins, the patient soon became entirely free from the previous bad symptoms, and regained rapidly its ordinary flesh and strength. I have seen this in such a number of cases, that I have deemed it desirable to mention it here, if for no other purpose to put you upon your guard while in attendance upon mothers and their newborn babies. Observations in reference to the condition of the head in very young children should never be neglected. The symptoms of tetanus in infants are the same in all respects as in the adult, except that the rigidity or continuous contraction of the muscles is not as severe, while the paroxysms of a temporary character are of more frequent occurrence than in the adult. It almost always runs a protracted course of moderate severity, but ends fatally in a very large proportion of all the cases. A few cases of recovery are on record, but the tendency of the disease is very generally to a fatal termination.

Prognosis.—This same remark, however, may be made in regard to all

the varieties of tetanus—idiopathic, traumatic and infantile—it being one of the most severe, painful, and fatal affections which you will have to treat.

Treatment.—As might be expected, in the management of a disease so generally tending to progress unfavorably until reaching a fatal result, a great variety of remedies have been tried from time to time, but without a satisfactory degree of success. At an early period, opiates were used freely, and in some instances in very large doses. And at the present time there are many who recommend as remedies of the greatest degree of efficiency, opium and the alcoholic class of anæsthetics. Some give from six to twelve centigrammes (gr. i to ii) of opium or its equivalent of morphine, every hour during the day, and increase it at night, and from fifteen to thirty cubic centimeters (fl.ʒss to ʒi) of brandy between each of the doses of the opiate. In some instances during the same period of time, injections containing hydrate of chloral either alone or combined with belladonna have been used as enemas, and more or less chloroform inhaled for temporary relief from the more violent spasmodic action, thereby subjecting the patient to the strong influences of full doses of opium, chloral, and chloroform at the same time. At an early period after I entered upon practice, the dependence was placed largely upon opium, and patients were given such quantities, that in a day or two the pain, with tetanic contractions, ceased, the muscular system relaxed, and the patients passed into a profound sleep. In such cases there was great danger that the quantity of the opium which had accumulated in the system would render the sleep one of profound stupor with contracted pupils and speedy death. I must caution you to strictly guard against giving patients, in any form of disease, opiates, and at the same time other anodynes, and anæsthetics in different modes, rendering it almost impossible for you to estimate correctly the amount of influence you are to get from such combination of narcotics and anæsthetics in any given time. If the doses are frequently repeated it is impossible for the system to eliminate these drugs as fast as they are given. For instance, when opium is given in doses of six or twelve centigrammes (gr. i or ii) every hour, if at the end of twenty-four or thirty-six hours the tetanic rigidity begins to relax and the pains cease, it is evident that a very large part of the opium taken is still in the system, and may develop not only sleep but a dangerous degree of narcotism. In many such cases the patients have died comatose—not from the disease but from the effects of the remedies used.

And in this affection, as in delirium tremens, there was a period many years since, in which death often resulted after the disease had subsided from the direct effects of the large doses of narcotics used for its cure. If it be true that tetanus depends primarily upon the establishment of a peculiar and extreme morbid sensitiveness in certain tracts of the spinal cord, connected through the nerves with the muscles of voluntary motion, the leading indication for treatment is to overcome that morbid condition of the cord without seriously interfering with the continuance of other important functions of the economy. From the knowledge that we possess of the *modus operandi* of drugs, we should expect to accomplish more in removing the pathological conditions constituting tetanus by such agents as physostigma or calabar bean, ergotin, cannabis indica, chloral hydrate, conium and hyosciamus, than from any other remedies now known. All these agents appear to be capable of diminishing more or less directly the morbid excitability of the cerebro-spinal nerve centers.

In scanning the medical literature of the present time there can be

found a varied amount of evidence in favor of the curative effects of the physostigma, cannabis indica and chloral. Dr. Watson, of Glasgow, Dr. Fraser, of Edinburgh, and some others, have reported a considerable number of recoveries from the efficient use of the physostigma, its use having been commenced early and pushed to as large a degree as would seem to be safe. Of the eighteen cases reported by Dr. Watson as treated by physostigma, ten recovered. Dr. W. M. Kane, of Philadelphia, treated a case successfully, in which the ordinary tincture of physostigma was given in doses of from four to twelve cubic centimeters (fl. ʒ i to ʒ iii) every few hours for several days. A well-marked case that came under my own observation of traumatic tetanus arising from the penetration of a nail into the bottom of the foot, although not recovering, was relieved to a very marked degree for several days by the use of the physostigma, cannabis indica and hydrate of chloral in combination. The effects of the remedies were such as to lead me to the confident conclusion that if they had been commenced in the beginning of the disease, it would have been controlled permanently. But the first four days in the progress of the case were passed under treatment entirely inefficient, and the patient had consequently become considerably exhausted before being put upon the remedies that I have just mentioned. Perhaps the whole management of ordinary cases of tetanus may be summed up in the direction to keep the room of the patient darkened, as perfectly free from noise and excitement as possible, the smallest number of attendants that will be adequate to administer to his wants efficiently, giving milk, beef tea or other liquid nourishment in small quantities while the patient can swallow them, and after a while add the use of nutritive enemas, and the prompt, efficient and persistent use of such doses as will be safe, of one or more of the remedies I have just mentioned. If they are used separately, my confidence would be first in the physostigma, next in ergotin and cannabis indica, and third in chloral. But I know of no reason why we should not give more than one of these remedies at the same time, especially a combination of physostigma and ergotin, or the cannabis indica and chloral. The extreme exacerbations may be palliated while carrying on this treatment by the inhalation, temporarily, of sufficient chloroform to mitigate the violence of the spasms. Some form of application may be made to the spine. The application of bags filled with ice water has been recommended by some, keeping them in contact with the whole length of the spinal column. There are, however, those who with equal confidence advise the application of bags filled with water, as hot as can be borne. While still others apply early thorough counter irritation, blisters and sinapisms. I should expect more benefit by cupping and the application of bags filled with water as warm as can be comfortably borne, kept steadily in contact with the whole length of the spine during the first two days, and if the disease was persistent, the application of blisters pretty extensively.

And where the cuticle had been raised, after the blister was removed, two or three centigrammes (gr. $\frac{1}{3}$ to $\frac{1}{2}$) of morphia might be sprinkled upon the raw surface two or three times in the twenty-four hours, and it would be likely to be taken up in sufficient quantity to produce a moderate degree of diminution in the sensibility of the sentient nerves of the part, and thereby help some in alleviating the sufferings of the patient. There are some cases of tetanus that are idiopathic in which there is evidently more or less of the malarious influence. Patients have been subjected to that influence, which is prevalent in the atmosphere where they live, and the symptoms of the tetanic disease are aggravated at certain times each

twenty-four hours sufficient to indicate clearly that this agent has produced some effect upon the patient. Where this is the case, while the same remedies may be given with all due degree of activity, moderately full doses of quinine should be added two or three times in the twenty-four hours. For if it can not be well taken by the mouth, it can be used hypodermically, or introduced by enemas through the rectum. In the treatment of tetanus in young infants, trismus nascentium, chloral has gained more reputation than any other one remedy. It should be taken in fair doses and increased gradually till either the disease yields or the patient dies. Some of this class of cases have been treated successfully with quinine. In all cases, whether those in which the disease has its appearance in young infants, or in traumatic cases, the extent of the wound should be carefully examined, and every source of irritation as far as practicable removed from it. If there is any evidence of the generation of septic influences, the thorough use locally of antiseptics should not be omitted. In a few instances where the disease has originated from injuries to sentient nerves in one of the extremities, amputation has been resorted to with a very few reported recoveries.

LECTURE LXXIX.

Hydrophobia—Its Causes, Clinical History, Pathology, Diagnosis, Prognosis and Treatment.

GENTLEMEN: Hydrophobia is a disease not of frequent occurrence but one of the most fatal with which the physician has to deal. It is supposed to originate from a specific poison, usually derived from wounds inflicted by some of the lower animals laboring under the disease. However, there is not wanting evidence strongly indicating the possibility of the disease originating without any such communication or inoculation. The lower animals chiefly subject to the disease are the dog, cat and other varieties of the same general class of the animal kingdom. As the dog, cat and other domestic animals have access to houses, and are more subject to attacks of this disease than any other species, they are the chief sources from which individuals become inoculated. The popular impression is that the disease is more apt to originate in dogs during the warm season of the year; hence the hottest part of summer has received the appellation of "*dog days*." And in some countries and municipalities even up to the present time, laws are enacted and enforced requiring dogs to be either shut up or muzzled during the heat of summer, founded entirely upon the supposition that their liability to become affected with hydrophobia is connected with the prevalence of high heat. This, however, is erroneous, as has been shown conclusively by statistical investigation. A paper read to the American Medical Association a few years since presented facts and statistics, clearly proving that rabies or hydrophobia was quite as prevalent among the domestic animals, particularly the dog, during the winter as the summer; consequently there is just as much necessity of muzzling these animals or preventing their running at large at one season of the year as at another.

When an individual has been bitten by an animal laboring under the disease, and in such a manner as to allow the introduction of any of the

saliva into the wound, there is great danger that inoculation will ensue, and an attack of the disease at some subsequent period will follow. I say when the wound is inflicted in such a way that more or less of the saliva of the rabid animal enters the wound, because there is sufficient evidence to justify the assertion that the poison is conveyed chiefly in the saliva. Inoculation with the blood of a rabid animal would probably produce similar results. But in the infliction of wounds by biting it is not merely the wound that causes the mischief, but it is caused by inoculation with the poison, which appears to impregnate the saliva of the animal. Consequently, when a bite is made through one or more thicknesses of clothing, there is a strong probability that the saliva will be wiped from the teeth of the animal by the clothing, and although penetrating deep enough to inflict a wound in the flesh, it will often happen that no saliva finds its way into the wound. In such instances the chances are strongly in favor of the individual escaping any subsequent harm. And as such are the circumstances under which a large proportion of the bites take place, it can readily be seen why it happens that a large proportion of those who are actually bitten by rabid animals do not suffer attacks of the disease. So far as statistics have been gathered it would appear that on an average not more than one in six or seven of those bitten ever become affected with the disease, which is probably owing to the circumstances connected with the manner of the bite, as I have just explained. The escape of so large a proportion opens a wide field for deception in regard to the use of preventive measures. It is natural to assume that the remedies which are applied to the wound and the mode of treatment adopted are the causes of preventing the subsequent occurrence of the disease, when in fact there may have been no inoculation with the poison. Where inoculation does take place the wound generally heals without any apparent difficulty, and the individual bitten remains apparently well, unless the mind is disturbed by anxiety and apprehension on the supposition that there is danger, for a period averaging from one to three months. In some instances, however, the incubation may be not more than two weeks, in others it may extend to six or twelve months, or if we are to credit the cases that are reported, it may remain dormant for two or three years, and then develop all the phenomena and results of genuine hydrophobia. I must confess, however, that it is a little difficult to conceive how a poison that has remained dormant so long a period should again assume an activity sufficient to produce so violent a disease.

It is more probable that in such cases, if all the facts could be known, either the disease originated spontaneously, independent entirely of the long-previous bite, or that a subsequent inoculation had taken place and escaped record. That the disease may and does originate in some rare instances without definite inoculation, I think we are justified in believing, although such occurrence may be very rare. A case came under my own observation in the wards of Mercy Hospital a few years since, in which no evidence could be found either within the recollection of the patient or any of his friends and acquaintances, that he had been bitten by a dog or any other domestic animal. No trace of injury could be found upon his person, and during the initial symptoms no particular locality afforded tenderness, which would suggest the possibility of a previous bite having been inflicted. Yet the case presented every symptom of typical hydrophobia, and proceeded as usual to a fatal termination. This was in the person of a man in the early period of adult life, whose business was that of a railroad engineer, but who a few weeks previous to his attack had been but little occupied in his business, and had pursued a

rather intemperate course of life, in lulging in frequenting dancing parties and places of amusement till late hours of the night, and of course subject to excessive excitement during the three or four weeks previous to his attack.

Symptoms.—The symptoms of hydrophobia in most subjects usually commence with the appearance of unusual mental anxiety and depression, coupled with a peculiar nervous excitability. The countenance is expressive both of anxiety and despondency. There is but little disposition to converse, little or no tendency to sleep, the mind is easily agitated and quickly provoked to ill temper. These phenomena usually are followed in from twelve to twenty-four, or at the longest forty-eight hours, by the addition of a feeling of constriction in the œsophagus and larynx, soon increasing to that of decided spasmodic action.

The choking causes the patient to make attempts to swallow with inability to do so, and the gasping for breath may be coupled with intense momentary mental excitement. The pulse now begins to be more frequent than natural and a little elevation of temperature. These phenomena soon assume the form of distinct paroxysms of spasmodic disturbance, particularly in the muscles concerned in respiration and deglutition. And these spasmodic movements are excited by almost every trifling occurrence that may take place. An attempt to drink any kind of fluid will provoke them to such an extent as to threaten strangulation or arrest of breathing. Medicines may be directly refused, and the patient may push away food and drink as though repugnant, when the real difficulty is the distress that is occasioned by the spasmodic action provoked by the attempt to take it. Any attempt to converse, any sudden noise, movements of the body or footsteps in the room, will very generally provoke more or less of this spasmodic action of the muscles of the chest, neck and throat. And even where every source of annoyance is avoided, the room kept darkened and as still as it is possible, the paroxysms of spasmodic action, though not so frequent, will occur usually every five, ten or fifteen minutes, and produce great excitement in the patient's mind from a sense of suffocation and apprehension of choking, leading sometimes to sudden and violent exertion. After the first two days have passed, in most cases, the paroxysms are accompanied by some delirium. The gasping for breath and struggles of the patient will sometimes in the midst of a paroxysm cause such irregular breathing as to produce frothy saliva from the mouth and occasionally sudden closing of the jaws, which may catch folds of the inside of the cheek or edges of the tongue and inflict wounds upon them, as in other instances of violent spasmodic action. In the popular mind these struggles and this sudden closure of the jaws and delirious condition of the patient, are construed into efforts at biting. Sometimes the irregular respiratory movements occasioned by the spasm cause a stertorous noise in the breathing, sometimes quite loud, which are also construed into resemblances to the barking of a dog. But the popular notion of patients laboring under hydrophobia biting and barking, are mostly erroneous. They suffer the most intense distress during the exacerbations, and are sometimes so delirious as to make extraordinary exertion to get out of bed, and when attendants restrain them, manifest a violence of temper as a part of their delirium, and not as a special manifestation of the disease. The strength of the patient fails rapidly in the progress of the disease; and the difficulty of taking medicines without increasing the violent paroxysms to which the patient is subjected often limit the means of administration to hypodermic injections, and inhalation of anæsthetic vapors almost entirely. The patients become prostrated so rapidly that they usu-

ally sink into a state of fatal exhaustion in from three to eight days; the average duration of the disease being about five days. The disease is distinguished from other spasmodic and cerebral affections mainly by the mental phenomena, accompanied by the peculiar paroxysms of spasmodic action limited in a large degree to the muscles concerned in the act of respiration and deglutition, together with inability to take anything, in the way of food or drink, without provoking paroxysms of much greater activity, and the consequent apparent repugnance, not to water alone, but to everything. Although the patients manifest intense desire for drink during the active progress of the disease, they are deterred, not by dread of water, but by the dread of the extreme distress and threatened suffocation that follows the attempt to take it.

Anatomical Changes.—In nearly all the cases which have been recorded embracing post mortem examinations, evidences of decided congestion or hyperæmia of the vessels bordering upon actual inflammation, have been found in the upper part of the spinal cord, medulla oblongata, convolutions at the base of the brain, and in some cases extending more or less into the central ganglia of the cerebrum. The case to which I alluded as occurring in the Mercy Hospital was examined after death and the medulla oblongata, crura cerebri, cerebellum and pyramidal bodies were most intensely injected with blood of a bright arterial hue. The injection of vessels, or congestion, extended along the lower part of the posterior lobes of the cerebrum, and also between the lower surfaces of the posterior lobes and the cerebellum. There was also increased fullness of the vessels as far anterior upon the base of the brain as the origin of the optic and pneumo-gastric nerves. The upper part of the cerebral hemispheres presented but little alteration from the natural condition; the interior of the brain also retained the normal degree of density and structural appearance, but when cut through below the corpus callosum nearer to the base of the brain, most of the vessels oozed blood in a way to indicate some degree of increased fullness. A very correct model of the medulla, upper part of the spinal cord, and whole base of this brain, is still open for your examination in the museum of the college. So far as post mortem appearances go, they would induce us to regard the medulla oblongata as the chief center of pathological change. And if we remember that the muscles of respiration and deglutition are more profoundly disturbed during the progress of the disease than any others we shall see that the symptoms and post mortem appearances are in harmony with each other. Undoubtedly, the specific poison which gives rise to the disease, when it originates from inoculation, spends the larger part of its disturbing influence directly upon this great cerebro-spinal center of the nervous structures. And it is the profound interference with the functions of respiration and deglutition, that so rapidly causes prostration and so certainly leads to a fatal result.

Prognosis.—While there are on record several cases claiming to be genuine cases of hydrophobia derived from inoculation, or the bites of rabid animals, reported as cured, it must be acknowledged that the prognosis in this disease is extremely unfavorable. If the cases reported as recovering were genuine hydrophobia, still their number compared with the whole number of cases is so small that it would represent the disease as one of the most uniformly fatal that the physician is called upon to treat.

Treatment.—From the remark I have just made you will infer that there are yet known no specific remedies for the cure of hydrophobia; and, in fact, there are none in which we can place very strong confidence, as to their ability even to modify materially its progress, except merely to mit-

igate the patient's suffering. The cases which have been reported cured have been subjected to various methods of treatment. One or two are claimed to have been cured by thorough, hot water baths; one or two by the use of curare; I think one is claimed to have recovered under the influence of large doses of cannabis indica; one by chloral hydrate; and another is said to have recovered under the influence of apomorphia, used by hypodermic injection. I will not go so far as some writers have gone in asserting that all these reported cases are fallacious, or that they were founded upon mistaken diagnosis, and that the disease treated was not real hydrophobia. I see no reason why cases may not be cured, provided the patient can be kept from a fatal degree of exhaustion until the modified or limited amount of congestion is relieved and the poison eliminated from the system. And if it be true, as I have previously suggested, that the disease may originate spontaneously, with the same form of congestion and local disturbance of the cerebro-spinal centers, developing symptoms precisely the same in all respects, except the absence of the specific poison, there would be no reason why this idiopathic development of the disease might not yield under the influence of remedies calculated to restore the contractility of the smaller vessels and lessen the peculiar grade of irritability involved in the disease. But while cases have been reported as cured under various remedies, I think each and all of these remedies have been tried in other cases with the most heroic faithfulness by every mode of administration practicable, and yet have failed so uniformly as to leave us very little confidence in their efficacy. It would seem that in those cases derived from inoculation of poison from rabid animals there were three leading indications to be kept in view in the management of each case: First, to administer as efficiently as possible such antiseptic remedies as might be supposed to exert a neutralizing or destructive influence upon the poison itself. Second, such as are calculated to overcome or counteract the extreme functional disturbances or spasmodic actions which threaten to suffocate or strangulate the patient. This would require the most efficient antispasmodics or nervous sedatives that we possess. The third indication, founded upon post mortem appearances, would lead us to use whatever remedies may be found practicable for lessening cerebral fullness, or hyperæmia of the vessels of the medulla and base of the brain. If it be supposed that the poison itself is essentially composed of organic germs, it could be met probably with no more efficient germicide than the bichloride of mercury in as active doses as the patient would bear without producing injurious results. This substance has been proven by several direct experimenters, especially Dr. Steinberg, of the army, and Dr. H. O. Marcy, of Boston, to be, by far, the most active agent in destroying the vitality of all known forms of bacteria, micrococci and bacilli that we possess. But aside from this, it would also act as an alterative, using the phraseology of former times, in lessening the inflammatory action, and therefore would be somewhat calculated to fulfill the third indication we have mentioned as well as the first. The second indication, to allay spasmodic action by lessening the extreme morbid excitability or irregular nerve influence radiated from the medulla upon the muscles of respiration and deglutition, a temporary resort may be had during the most violent paroxysms to anæsthetics by inhalation. Chloroform, ether, nitrate of amyl, using due caution in their administration, may be made greatly to mitigate the sufferings of the patient, although these agents appear to exert no curative effect. In the same direction we might expect much from introducing in any practical way into the system efficient doses, either of cannabis indica physostigma, ergotin, or chloral hydrate. To attempt to

put patients into hot vapor baths, and still more into hot water baths, involves a degree of disturbance that usually aggravates the suffering and renders more frequent the violent spasms, and thereby tends to produce more harm than benefit. The intelligent selection of remedies aimed at the accomplishment of the three indications I have mentioned, and their judicious and persevering use according to the indications and principles which have been explained, will afford the patient the best chance of recovery. The patient's room should be darkened and kept free as possible from every variety of annoyance or unnecessary disturbance, with efforts to sustain the patient with nourishment either by injections or by swallowing, if the latter act can possibly be performed.

Prophylaxis.—In regard to a disease so uniformly fatal, and in which the cause is very generally known as consisting of a poison by the direct biting or infliction of a wound, the subject of prophylaxis becomes one of paramount importance. Almost the only safety the patient may be supposed to have, if introduction has certainly taken place, is based upon the success of measures that may be adopted to prevent the poison from developing in the system. The means of prevention may be divided into two classes: one having for its object the actual prevention of disease, by the destruction of the poison before it can be taken up by the vessels of the wound, and the other the prevention of the multiplication of the poison in the system after it may have been absorbed. The first object, that of preventing the poison from being absorbed, is regarded by many as the only reliable method, and the means consist of immediate excision of the part bitten *in toto*. Where the opportunity for doing this is afforded almost immediately after the infliction of the wound, and it is certainly known that the wound is that of a rabid animal, and has been inflicted directly upon the naked part and not through the clothing, it would be justifiable to excise it, cutting out the flesh so completely as to be pretty sure of removing all the poison. After such excision, cauterize the surface that is left and wash it thoroughly with some antiseptic wash. But it is not often, or at least it is only in a minority of the cases, that the surgeon is so near at hand, or the parties so self-possessed in their intelligence, that immediate excision is available. Where this is not available most writers encourage the direct application of caustics. For this purpose strong nitric acid, nitrate of silver and various other caustics, such as undilute carbolic acid, have been recommended and extensively used. Where the wound has penetrated too deeply to allow complete excision with the knife, caustics must be made to penetrate as deeply as the wound itself. Another means of destroying the poison before it is taken up is by the application of efficient antiseptic solutions. Pretty strong solutions of carbolic acid, the sulphite or hyposulphite of sodium or a solution of the permanganate of potassium, and still more a solution of the bichloride of mercury may be made, not only directly to the surface of the wound, but by saturating fibers of lint and crowding them as near to the bottom of the wound as possible.

After the wound has been thoroughly wet, lint may be saturated with a solution of either of the substances that I have named, and allowed to remain over the wound constantly, the wetting being renewed several times a day, thereby rendering it probable that the solution used would be absorbed through the same vessels freely that were most likely to have taken up the poison, if any had really entered the vascular system. But the efficacy, you will readily see, of any of these means, whether excision, cauterization or saturating the wound with antiseptics, depends entirely upon the question whether they have been made to reach the poison or to

intercept it before it has entered the circulation of the blood. After having entered the circulation, it can not be claimed that any of these agents are reliable. According to my observations, not more than one in ten of all the bites that are inflicted by dogs or animals that are supposed to be rabid are brought under the eye of any person prepared to apply any of these remedies efficiently in less than from one to ten hours from the time of the infliction of the bite. And you all know that the shortest of the periods named, *i. e.*, one hour, is sufficient for any active poison to be taken more or less into the vessels, when in contact with the surface of an open wound. Consequently, in much the larger per centage of cases it must be acknowledged that the poison has probably passed beyond the reach of local treatment. This must not deter us from adopting local treatment as a possible means of destroying the poison before it has entered the circulation. So far as remedies are concerned, I should hold it to be a duty to apply some form of local treatment in every case presented, if no longer time than ten, twelve or twenty-four hours had elapsed from the time of the infliction of the wound. As to the relative value of the different modes of local treatment, I am not prepared to make a positive statement. The great preponderance of advice is to excise or cauterize or both. But for the last twenty years I have done neither, but have contented myself with the thorough saturation of the wound, as soon as the bites have been brought to my notice, with solutions of known strength, either of the bichloride of mercury or of a combination of carbolic acid and the hyposulphite of sodium. When the latter remedies are to be used, I make a solution containing at least twenty per cent. of the carbolic acid and thirty per cent. of the hyposulphite of sodium; and first introduce this solution as deeply into the wound as possible, and subsequently keep lint constantly wet with the solution laid directly over the part, renewing it often enough to keep it moist constantly for two or three days. At the same time, from the very first knowledge of the case, I have uniformly ordered a solution of the hyposulphite of sodium, with tincture of belladonna to be administered internally. I give the hyposulphite of sodium in doses of six decigrammes (gr. x) with the same number of minims of the tincture of belladonna the first forty-eight hours at intervals of once in two or three hours, and subsequently continue them regularly three times a day for at least four weeks or during the greater part of the first month after the infliction of the bite. I say, this has been my uniform treatment of all wounds that have come under my observation, suspected of having been inflicted by rabid animals. I have taken some pains to learn the results in as many of the cases as possible, and there has not yet occurred a single instance in which hydrophobia has ensued in any of the parties that have been brought under my observation and thus treated, although one or more cases of hydrophobia occur in this city and result fatally almost every year.

It does not follow, however, from these facts, that any one of the cases would have had hydrophobia if they had not been treated at all; for a very large proportion of all the cases of wounds or bites that men, women and children receive from dogs and cats, whether belonging to their households or in the streets, that they suspect may be rabid, are cases in which the animal had nothing of the disease suspected. It is to be presumed that occasionally one is rabid. But one difficulty in the way of carrying out an investigation concerning the condition of the suspected animal, so as to determine whether the bites that you are called upon to treat are inflicted by rabid animals or not, results from the almost universal practice of immediately killing the animal. A dog is encountered in the

street looking tired, haggard, acting cross, snaps at parties who encounter him, soon attracts attention and in consequence of being followed up or meddled with, becomes still more cross, endeavors to bite his way, and inflicts wounds upon one or more parties. The animal is immediately dispatched and put out of the way. No person competent to judge has seen him, and being dead, there is no mode of determining positively whether he was laboring under any disease of the nature of hydrophobia or not. This, however, is the history of nine out of ten of all the cases that create alarm in the community. If we make allowance for these, and then also make some allowance for the failure in many of the cases of really rabid animals to convey the poison through the clothes which the teeth penetrate before they enter the flesh, we shall see that of all those bitten only a small number are really inoculated. And therefore it is quite probable that any person occupying a wide field of observation, would have a number of these wounds, which are suspected to have been inflicted by rabid animals presented to him and subjected to treatment of some kind, in which there would have been no bad results developed if there had been no treatment at all. And yet no one, as a physician, would be justified in assuming that every case coming to him was harmless, and therefore refuse to take proper precautious. On the contrary, the possibility of the introduction of so deadly a poison should cause us as intelligently as possible to neutralize it from without, by agencies most certain to destroy it before it reaches the interior, and with equal promptness to introduce into the blood, as freely as will be borne without injury to the patient, such agents as are supposed to be most efficient for destroying all existing germs, and of preventing further development from any that may have been introduced. The agent that is used internally should be continued not less than from four to six weeks. Another benefit resulting from this treatment is the influence it exerts on the mind of the patient. The simple fact that something is being done to destroy the action of the supposed poison has a powerful influence in quieting the fears of the patient and his friends, and in giving them confidence, hope and cheerfulness, which is exceedingly desirable, from the well known fact that the opposite condition of mind, namely, fright, apprehension, dread, foreboding of terrible consequences, have a powerful influence in encouraging the development of the very disease that is dreaded.

LECTURE LXXX.

Sun-Stroke—Its Varieties, Causes, Clinical History, Anatomical Changes, Prognosis, Diagnosis and Treatment.

GENTLEMEN: Under the terms, sun-stroke, heat-stroke, *coup de soleil*, I have been grouped a class of cases of suddenly developed disease dependent more or less for their immediate causation upon high temperature. It is not essential that the high temperature be produced by the sun, or that the sun's rays be admitted directly upon the subject taken sick. A study of the various cases described as belonging to this class will resolve them into three groups, having some differences which are

important to recognize, especially with a view of properly adjusting treatment. Of those which have been produced by the more direct, intense action of the heat of the sun, there are a few cases which appear to be simply acute attacks of meningitis. They correspond in all respects with the most severe grade of inflammation of the meninges of the brain, as I have already fully described to you when speaking of the local inflammations, and consequently these cases need not be further considered here. The more numerous class of cases included under the general designation of heat-stroke, occur generally under the direct action of the sun, or in a very high temperature of the air, and are characterized by all the symptoms of sudden and severe congestion of the vessels of the brain, and the membranes covering it.

Symptoms.—In these cases the patient, while exposed to high temperature, begins to feel a sense of confusion and pressure in the head, distinct buzzing or rushing in the ears, dimness of sight, more or less intense pain in the head, and in a few moments staggers and then falls to the ground or to the floor in a state of entire unconsciousness. Sometimes as they fall a shudder like a slight electric shock passes through the muscular system, after which the muscles more generally are relaxed and the limbs quiet, but the face becomes deeply suffused with redness, soon assuming more of a purplish or cyanosed hue; the breathing becomes hurried, irregular and sometimes stertorous; the pupils of the eye are slightly dilated, though sometimes varying or vacillating from contraction to dilatation; the vessels of the conjunctiva are unnaturally full; the pulse usually frequent and somewhat variable, sometimes bounding and full, at other times small or contracted, but pretty uniformly frequent, and the heart's action partaking of a similar variable character, sometimes throbbing or pulsating violently, and then again more feeble and irregular as to the rate of frequency. In the most severe class of cases the pulse grows more rapid and more easily compressed, the lips and face more deeply purple, the breathing more and more obstructed or stertorous, and in from fifteen minutes to two or three hours death takes place without any return of consciousness, though sometimes preceded by a general convulsion, but in a larger number by entire muscular relaxation. Cases of less severity may linger, from three to twelve or eighteen hours, and then terminate fatally apparently by suspension of the cerebral function, or by cessation of the heart's action after a few paroxysms of violent beating. In cases of a little less severity the symptoms may be of the same character, sufficiently severe to bring on complete unconsciousness, a flushed, turgid condition of the vessels of the face, head and neck, continuing for five or six hours, when signs of improvement begin. These are first noticeable in the surface becoming less purple, the pulse slower, more steady, and the breathing less stertorous, with a deeper, fuller inflation of the lungs. This improvement continues gradually until in eighteen or twenty-four hours the patient has recovered his consciousness; the pulse and respiration returned more nearly to their natural standard, and although extremely exhausted and feeble, convalescence has ensued. One symptom mentioned as characterizing these cases, and a very important one, is the rapid development of a high temperature. In the severer class of cases progressing toward a fatal result, the temperature rises so rapidly that in the axilla the thermometer will often range from 42° to 43° C. (108° to 110° F.) Less severe cases will show a range of temperature from 40° to 42° C. (104° to 108° F.) during all the first twenty to thirty-six hours, if the patient lives that length of time. But as the symptoms of recovery and improvement show themselves, the temperature falls pretty rapidly till it returns to the natural standard.

Anatomical Changes.—The anatomical changes which are found, as might be expected from the rapidity with which death approaches, and the brief time that the patient is sick, are not of a structural character; yet many changes in the condition of the circulation are noticeable in all these cases, and also in the quality or condition of the blood. The sinuses and veins within the cranium are usually strongly congested or turgid with blood; the right side of the heart is in the same condition with a considerable amount of congestion and engorgement in the lungs; while the left side of the heart is usually empty and contracted; the blood itself is very much diminished in the coagulability of its fibrine, indeed, not infrequently in an entirely fluid condition, of a dark hue, and many of the corpuscles crenated or puckered at the edges.

Heat Exhaustion.—The remaining group of cases which have been classed under the general head of sun-stroke, and which really are the most numerous class of cases met with in practice, occur not so much from direct exposure to the rays of the sun as from the exhaustion of continuous high temperature. The symptoms differ very decidedly from those last described. The class of persons that are most apt to be attacked with this variety of disease, which by way of distinction is called *heat exhaustion*, are those undergoing either excessive physical exercise in an unusually warm atmosphere, whether it be by day or night, in-doors or out, or those who have been addicted to the habitual use of alcoholic beverages. That the use of alcoholic drinks greatly predisposes to this form of disease has been proven by the observation of many medical men attached to armies, witnessing the results in soldiers upon a march under a high temperature. The uniform testimony of these observers is that the attacks are limited, not absolutely, but in a very great degree, to those who are addicted to the use of alcoholic drinks in some form. Dr. Bartholow, in his practice, speaks of his own observation when connected with a division of the army on a long march under high temperature, where for several days many succumbed to the influence of high heat, but they were limited almost entirely to those addicted to strong drink. A large proportion of all the cases that occur in our cities during the occasional waves of very high atmospheric heat in summer belong to this class. In 1868 a period of this high heat caused several hundred deaths from what was denominated *sun-stroke* or *heat exhaustion* in New York; several seasons in Saint Louis the number of deaths has been very large from the same cause. In this city our waves of high temperature are always modified in a material degree by the cooling influence of the lake upon our border, and consequently these cases are far less numerous here than in the cities more nearly in the middle belt of the United States. Still in those summers when there occur one or more extraordinary waves of high heat lasting through several days in succession, it is not uncommon to meet with attacks of heat exhaustion well characterized, and occasionally reaching a fatal result.

Symptoms.—The symptoms of this class of cases differ from those I have described as from direct heat upon the head, not so much in the feelings of the patient as in objective phenomena. For the patient complains sometimes for an hour or more of some sense of weakness or exhaustion, dizziness or reeling in the head, noises in the ears, momentary dimness of vision, but especially a great sense of exhaustion; and yet, if a laboring man, he not infrequently persists in keeping at his work, and in from half an hour to two or three hours after the supervention of these feelings he begins to reel, the sight grows dim, his attempts to talk fail him and in a moment he falls prostrate and generally becomes entirely unconscious;

but instead of an appearance of congestion or fullness his face is pale, lips pale or livid, his surface cool, pulse quick, somewhat weak, very variable and irregular; heart's action generally weak, systolic movements short, quick and irregular; respiration imperfect, giving imperfect inflation of the lungs, and some stertor; the temperature hardly above normal, pupils of the eyes usually decidedly dilated, sometimes relaxation of the sphincters of the bladder and rectum, allowing apparently involuntary discharges, but more frequently only a scanty secretion of urine. In the more severe of these attacks the paleness of the surface, coolness of the extremities and feebleness of pulse increase with the supervention of a copious, cold, clammy sweat, irregular, sighing respiration, and in perhaps half an hour to an hour after the supervention of the attack, sudden death from cessation of the heart's action or syncope. But the great majority of this class of cases if they are at all well taken care of will remain in a feeble, cool, unconscious condition for two or three hours, when they begin slowly to improve. The first noticeable improvement is in the color of the lip, in a slower and steadier condition of the pulse and a more natural systolic action of the heart. Three or four hours later consciousness is restored and the patient, although feeble and feeling greatly exhausted, is nevertheless in a convalescing condition; and under proper management in regard to rest and nourishment, in a few days he will recover fully and resume his ordinary duties. In the cases of this class terminating fatally, the post mortem appearances differ from the group just previously described in there being much less evidence of congestion and fullness of blood in the vessels of the brain, although there is usually considerable congestion of the venous part of the circulation in the lungs and fullness of the right cavities of the heart with dark, imperfectly coagulable blood. The blood is more profoundly altered in its properties and in the condition of its corpuscles than in the cases previously mentioned. The difference in the pathology of this and the preceding group would seem to consist chiefly in the fact that in the first group, or those of heat fever, there is, with the deteriorative action of high temperature upon the quality of the blood, a primary and direct dilatation of the vessels of the brain and its membranes, and in the lungs perhaps, from vaso-motor paralysis, causing early and intense local congestion in these organs with diminished oxygenation and coagulability of the blood and consequent incapacity to maintain its natural impression upon the various tissues of the body; while in the second class of cases or those of heat exhaustion, the phenomena depend almost entirely upon the extreme alterations in the properties of the blood and in the impairment of the property which I have denominated vital affinity throughout the whole muscular structures of the body, without special local congestion or hyperæmia in the brain. This absence of the local hyperæmia or engorgement causes the coldness or low temperature in the second class of cases, and its presence explains the rapid accumulation of heat in the first class.

Diagnosis.—But little difficulty can arise in forming a correct diagnosis in either variety of the cases I have been describing, where all the facts connected with the condition of the patient at the time of supervention of the attack can be known. The sudden supervention from a state of previously comparative good health, to the intense engorgement or fullness of blood in the vessels of the head and neck, accompanied by the symptoms that I have described as taking place under a high temperature, especially under exposure more or less to the rays of the sun, can hardly leave a doubt upon the mind of the physician as to the nature and origin of the disease. But in cases, which may happen, where the patient is found

perhaps upon the highway or in some place where he has been overtaken alone with no one to give any history of his previous condition or circumstances, the question will immediately arise in regard to the first class of cases, those accompanied by congestion or heat fever, as to whether the patient is laboring under an attack of apoplexy, or the excessive stupor of intoxication from alcoholic beverages. From apoplexy, sun-stroke or heat fever may be generally distinguished by the character of the pulse, respiration and temperature. In apoplexy, the pulse is more uniformly slow, full and labored, with sustained cardiac force or impulse. The breathing is more constantly stertorous, with the well-known puff of the lips and cheeks in the act of respiration. The pupil of the eye at the beginning or early stage is more generally contracted. If it be in the advanced stage in apoplectic patients the pupils may be dilated, but they seldom correspond the one eye with the other, either in the degree of dilatation or in the axis of vision. Apoplexy rarely, if ever, affords anything like the high temperature that is found in the class of cases of heat fever. From profound intoxication, heat fever or sun-stroke is still more readily distinguished on comparing the symptoms critically, because the state of profound intoxication, either from alcohol or opium, is accompanied by a reduced instead of increased temperature. Opium contracts the pupils strongly, while alcohol not only reduces the temperature instead of increasing fever heat, but it produces also an odor in the breath which can generally be detected, and the breathing is altogether steadier and slower; indeed, slower than in health, and much steadier and more uniform than that existing in an unconscious state from heat fever. If we compare these same diseases, *i. e.*, profound stupor from alcohol or narcotics and apoplexy, with the cases of heat exhaustion, we may find more difficulty in some respects. But from apoplexy, heat exhaustion is distinguished, by the fact that the patient is pale, usually sweating profusely, and cold, with a very feeble pulse, symptoms which are in direct contrast with what are usually found in connection with apoplexy. But the phenomena of profound drunkenness or extreme alcoholic intoxication, and those of heat exhaustion, present many points of positive resemblance. In both, the temperature is low. In both, there may be moderate dilatation of the pupils, with a pulse soft, irregular and easily compressed. But in heat exhaustion, the pulse is usually much more rapid as well as feebler than it is in alcoholic intoxication.

Usually the respiration in heat exhaustion is also more unsteady, panting perhaps, and then interrupted, like one tired, than it is in a state of intoxication. The alcoholic odor in the breath generally characterizes intoxication and would be a suitable mark of distinction were it not for the fact that heat exhaustion very frequently attacks those who are already more or less under the influence of intoxicating drinks. Consequently you might have a case of heat exhaustion with an alcoholic breath. But, however difficult it may be to distinguish them primarily in the height of their development, their progress leaves a sufficient margin of difference to enable the diagnosis to be made in a few hours. Alcoholic stupor passes off gradually, all the symptoms approaching more and more toward the natural condition, till the individual appears to be only in a natural sleep, while heat exhaustion, if it be only a case of average severity, also in a few hours begins to diminish. The patient, however, arouses himself much earlier and exhibits much greater weakness, and yet much less of the unsteadiness of gait and peculiar mental traits that characterize an individual coming out from a condition of extreme intoxication.

Prognosis.—When sun-stroke or active heat fever is the result of intense action of the sun's rays directly upon the head, there is great tendency to a fatal termination. In the group of cases, however, that we have denominated heat fever, while there is much danger to life in a large proportion of the attacks, and a high ratio of deaths has resulted wherever these cases have become numerous, still they are not necessarily fatal. But the milder cases tend spontaneously to recovery, and many of the more severe cases, if taken in charge and treated judiciously from the beginning of the attack, recover. It must be admitted, however, that this class of attacks involve much danger, and yield a pretty high ratio of mortality. Of those classes denominated heat exhaustion, a much more favorable prognosis may be given. Under any judicious management only a small ratio of mortality results in this class of cases. If the attack, however, is severe, complete insensibility supervenes rapidly, and the pulse presents, from the first, great feebleness with irregularity of respiration and very much depression of mind. When the heart acts tumultuously for a few seconds, and then slow and feeble, it may be said that there is very great danger of a fatal result from syncope, or entire cessation of the heart's action. But of all the cases of less sudden and severe development there is reasonable prospect of recovery, unless the patient has been previously very much impaired in his vitality and recuperative energies, by habits of intemperance or other exhausting influences.

Treatment.—As you will have inferred from the description both of the symptoms and anatomical changes, no one treatment can be mentioned that is suited to all the cases grouped under the heads of *sun-stroke*, *heat fever* and heat exhaustion. The different cases require to be very carefully discriminated, that their treatment may be judiciously adjusted to fulfill the indications of each case. Those denominated heat fever, in which there are rapidly developed symptoms of great fullness of the vessels of the head and face, and more or less accumulation of blood in the lungs, with a rapid rise of temperature, the indications are clearly for the application, promptly, of such measures as are calculated both to lessen the fullness of blood in the parts congested and to arrest the elevation of temperature. Consequently the prompt application of cold to the head and indeed to the whole surface, directing the nurse to wash the head and trunk of the patient over quickly but freely with cold water, sponging him subsequently with the same until the temperature begins to fall, constitutes one of the measures that can be made most available and efficient in the onset of the disease. In India, where these attacks are of frequent occurrence during some parts of a more than usually severe summer, the practice of applying douches of cold water to the patients and wrapping them subsequently in cold blankets with ice caps to the head is considered the most efficient practice, and of late years it has been much resorted to in some of the cities of our country where these cases are of frequent occurrence. In addition to these measures, dry cups between the shoulders and upon the back of the neck and the application of leeches to the temples may also be of some value. As soon as the patient can be made to swallow, remedies may be given to procure moderately free evacuations from the bowels and to encourage healthy and active secretion by the kidneys. But before the patient is conscious enough to readily take medicines internally, the bowels may be moved to some extent by enemas of warm water containing common salt or sulphate of magnesia in solution, and the circulation may be more or less influenced favorably by the use of digitalis. This remedy may be used hypodermically or it may

be used in the form of enemas into the rectum. After the temperature has been reduced by the anti-pyretics externally and the use of digitalis, and sometimes cupping or leeching, if the symptoms improve, there can be but little done except to maintain the effects of the digitalis and the cold applications in a less energetic manner till the temperature falls to the natural standard and consciousness is restored. After its arrest, for several days a mild, plain diet and the avoidance of mental and physical exercise will be sufficient in most cases to complete the recovery of the patient. In many instances, as I have remarked when speaking of the symptoms in the advanced stage of this class of cases, convalescence occurs. Where general convulsions make their appearance the most efficient means for relieving them are probably hypodermic injections of morphia, being cautious to use such doses as will not over-narcotize; or the inhalation of chloroform.

Practitioners should be very cautious, however, how they use both these agents simultaneously, as has sometimes happened. I have known one or two instances where patients, not from heat stroke but from convulsions from other causes, had taken full doses of chloral internally, at the same time had hypodermic injections of morphia, perhaps twice in succession at short intervals, and as the convulsive movements did not cease readily, inhalations were added. The convulsions soon ceased, but with the cessation, profound stupor, rapidly failing pulse, and finally cessation of life followed. It may happen that in using pretty full medicinal doses of two or three different narcotics and anæsthetics, the combined effect which comes to be developed is much greater than has been estimated: And while they may overcome the morbid action for which they were given, the amount present in the system is sufficient to immediately produce a fatal result as the direct effect of the remedies themselves. Consequently, while it is admissible, either to parry convulsions in these cases by chloroform inhalation, or inhalation of other anæsthetics on the one hand, or by the judicious use of hypodermic injections of morphia, or morphia and atropia together, and to endeavor to accomplish something by enemas, using pretty full doses of chloral, you should be cautious not to use all these agents so rapidly one after the other that the effects accumulate in the system sufficient to develop a greater influence than had been intended. In the treatment of the second class of cases, or those which we have denominated *heat exhaustion*, where the surface is pale and cool, skin relaxed, circulation irregular and feeble, there are, of course, no indications for the use of the cold douche, or the external application of cold in any form. Neither is there any indication for depletion in any direction. The patient should be put entirely at rest in as cool fresh air as possible; warm applications applied to the head, perhaps warm bottles and flasks of warm water along the spine, and such remedies given internally as are calculated to improve the tone or contractility of the muscular structures, especially of the heart, and thereby counteract the tendency to impairment in the quality of the blood. In the unconsciousness of the patients and difficulty of their swallowing, remedial measures are limited largely to such remedies as may be used in hypodermic injections and enemas. Perhaps as good a combination as could be used for an enema consists of ten cubic centimeters (fl. ʒiiss)of the fluid extract of valerian, two cubic centimeters of the tincture of digitalis and one cubic centimeter of the tincture of opium in sixty cubic centimeters of water about milk warm. An enema thus composed passed into the rectum gently and the parts supported as the syringe is withdrawn for a few minutes, will frequently be retained, the greater part of it

absorbed, and the effects of valerian and digitalis on the circulation are as favorable as can be induced by any other remedies. Such an enema may be repeated at intervals of three or four hours, during the first twenty-four hours in the progress of the case. Usually during that time the patient will have so far progressed in his recovery as to require little else than simple nourishment and rest to complete his recovery. If the enema can not be retained in the rectum sufficient to be absorbed, the digitalis may be introduced hypodermically. In the same manner you can also introduce moderate doses of the sulphate of quinia, or sulphate of cinchonidia for additional tonic effect. Most writers recommend the liberal use of alcoholic remedies in these cases, advising brandy or whisky to be given by enemas, and when the patient can swallow to be taken internally. My own experience has led me to the conclusion that if the patient had rest in good air, aided by the enemas that I have indicated, whenever he is capable of swallowing brandy or whisky, he is equally capable of taking enough milk, beef tea or any other suitable nourishment, and for stimulants, tea and coffee, or their active principles, theine and caffeine, which are much more efficient and valuable than any kind of alcoholic remedies, and will yield a larger ratio of ultimate recoveries. It is a little curious to contemplate a process of reasoning by which it is inferred that the very agents that are most efficient of all others to predispose to and favor attacks of heat exhaustion should be so generally resorted to, and recommended as remedies in the treatment of the disease. But it only illustrates that apparently fixed and almost irresistible habit of resorting to alcoholic agents for every conceivable condition that presents an element of supposed weakness. Of course if the patient recovers after using any of that class of remedies, it is taken for granted that they aided in his recovery, notwithstanding the experience of those who withhold them, gives a greater ratio of recoveries than were obtained under their use.

LECTURE LXXXI.

Del'rium Tremens (Mania-Potu)—Its Causes, Clinical History, Anatomical Changes, Diagnosis Prognosis and Treatment.

GENTLEMEN: We next invite your attention to a class of cases of disease which have usually been included under the names of delirium-tremens, or mania-potu. As the name would indicate, at least the second name mentioned, the disease to which I allude arises chiefly from the habitual and excessive use of alcoholic beverages. A very similar condition of the system, however, may be induced by the use of opiates and other narcotics and excitants. But practically they are of very rare occurrence, except as the result of the use of alcoholic drinks. The greater part of the cases by far are met with in those persons who are addicted to the use of the stronger drinks or distilled spirits, such as whisky, brandy, gin and rum, although the disease may be produced by the use of fermented drinks alone; yet such is seldom the case, for the simple reason that the quantity of alcohol in the fermented drinks is so small as to require a very large amount of the liquids to produce the peculiar effect upon the brain and nervous system which constitutes *delirium tremens*. The disease is most general-

ly the result of the continued and excessive use of the stronger alcoholic beverages through a period of from one to four weeks, and at the same time the use of but a very limited amount of ordinary nourishment. You are all aware that as an ordinary rule, the individual who commences what is known as a period of dissipation or of almost continuous intoxication, soon loses his appetite or relish for food, while his period of excessive drinking continues. Whether it be one, two, three or four weeks, he seldom takes a sufficient amount of ordinary wholesome food once a day. The result is that his blood becomes impoverished of nutritive elements, derived from the daily supply of food, and becomes surcharged with the products of disintegration and waste that are retained in it from the effect of the alcohol in diminishing the elimination of waste ingredients through the lungs, or taking up of oxygen in the opposite direction into the blood. This impoverishment of nutritive materials, coincident with a steady increase of the effete constituents, interferes directly with the play of vital affinity and molecular changes in the processes of nutrition and disintegration. Sooner or later this places all the functions, and especially the functions of the cerebro-spinal nervous system, in a condition in which it can no longer perform its natural office. The pulse becomes generally soft, quick and irregular, skin cool, face pale, muscular system tremulous and unsteady, mind excited and apprehensive, little or no disposition to sleep; and after the commencement of these symptoms in from twenty-four to forty-eight hours the tremulousness is much increased, the pulse has become still more disturbed, lips bluish, face rather haggard and anxious, and the mind decidedly beginning to lose its power of self-control, and to be filled with images and hallucinations; noises are heard that are imaginary, startling visions generally of unsightly and unpleasant objects appear on every side, and these so rapidly increase that the patient becomes entirely delirious, or at least incoherent, and has no disposition to sleep. Frightful objects now appear to the patient in any and every corner of the room and on the bed, sometimes in the bed, keeping him in frantic efforts to get away or drive the snakes and demons away, until after three or four days and nights he arrives at a stage of extreme exhaustion; yet still sleepless, trembling, agitated in almost every muscle, with extremely quick action of the heart, thready and excited pulse, cold, extremities, sometimes frequent discharges from the bowels, and occasionally vomiting with scantiness of urine, and unless relief is obtained, in this class of cases, death from exhaustion supervenes, more generally at the end of the first or second week. While some cases thus terminate fatally, the great majority of them, if placed under any judicious management, will proceed to the development of all the phenomena I have indicated in a characteristic degree, and after five or six days the excitement begins to abate, the patient catches now and then a little quiet slumber, takes more nourishment, and from day to day the pulse becomes more steady, the mind less annoyed by hallucinations, sleep more natural, and at the end of nine, twelve or fourteen days convalesence is fully established. The patient, though weak and pale, soon recovers his usual appetite and feeling of health while at rest, but is not well able to return to work, requiring either much mental or physical exercise until more time has been had to restore the normal condition of nutrition. There are all degrees in the severity of the attacks of what are called *delirium tremens;* from that stage where the patient is simply sleepless, apprehensive, startled at every noise or footstep and occasionally troubled with hallucinations of vision or sight, up to that extreme degree of development which furnishes perhaps the most violent and severe form of tempo-

rary mental derangement known, a form in which the patient makes the utmost exertion to escape, taking two or three persons to keep him in bed and prevent him from doing himself or others harm. Some of these cases in the active stage present the most frightful picture of terror, especially at night, that can be imagined. Sometimes the protracted paroxysm terminates in fatal exhaustion before the end of a week. But more frequently the excitement gradually subsides until the case ends in recovery. There are two classes of cases of delirum tremens. One class consists of patients who are attacked after they have suspended the use of alcoholic drinks, and the popular idea is that their delirium comes from stopping their drink too suddenly. The other class is composed of patients in whom the delirium is manifested while they are still taking their full supply of alcoholic drinks. In the first class the symptoms of delirium of a characteristic type may come on in from twenty-four to forty-eight hours after the alcoholic drink is stopped. But more generally the disease develops in from one to two weeks or the patient escapes an attack altogether. As I have just remarked, the popular idea is, that the delirium is caused by stopping the drink too suddenly. I am by no means satisfied, however, that this is true. On the contrary, in all cases of this kind that have come under my observation the system had become so disordered or the stomach so irritable as to prevent them from taking more of either food or drink; and consequently they had no power to replace the exhausted nutritive elements of the blood and tissues in time to prevent the development of the characteristic functional disturbance of the brain. The delirium came not because they stopped drinking altogether, but because they failed to stop before the organs of digestion and assimilation had become too much disordered to immediately resume their natural functions. Under my own observation, both in private practice and in a long period of attendance upon a public hospital in which many of these cases are admitted every year, I am sure that in as high a ratio as three out of four of all the cases I have seen, the delirium has supervened during the time the drinking was being actively continued. The patients have passed frequently into a state of delirium in its full development, while they were receiving a full supply of drink, and were taking it several times in a day. There is, however, little or no difference in the symptoms or course of the disease, whether it has supervened after drinking has been abandoned, or while it is being continued; I think the general experience of all has been that the delirium supervening during the progress of drinking is more likely to be persistent and dangerous than where it supervenes in a few days after the intoxicant has been suspended. As the degree of severity differs widely in different cases of both classes, so the duration also differs much. In some instances of the milder type it will continue only three or four days and nights, when in others it may continue as many weeks. More generally the course of the disease is to run through its stages and terminate in from one to two weeks. Under judicious treatment very few cases continue beyond five or seven days.

Anatomical Changes.—There are no phenomena revealed by post mortem examinations of those who die during the progress of delirium tremens that may be said to be characteristic, or the direct result of morbid action connected with the delirium. Almost all such cases show increased redness or vascularity of the mucous membrane of the stomach, sometimes of the duodenum also, with some degree of fullness of the vessels of the right side of the heart, moderate congestion in the capillaries of the lungs and some degree of hyperæmia or increased fullness of the vessels of the brain and its membranes. In some instances, however,

there is hardly more fullness of blood in the vessels of the brain and membranes than natural; but on examining the structure of the brain minutely, there has been found some evidence of changes in the nerve cells, indicating fatty degeneration or the appearance of fat granules and some degree of sclerosis or hypertrophy of the connective tissue, thereby giving to the substance, when cut across and minutely examined, either increased hardness, which is the more common, or more rarely the opposite, called softening. These changes, particularly those in the mucous membrane of the stomach, and that indicating structural degeneration in the nerve tissues of the brain or in the muscular structure of the heart, where sometimes the same appearances of fatty degeneration exist as in the brain, are the result not of the delirium, nor do they occur during the progress of the delirium; but they are the effects of the alcohol upon the structures of the body during all the drinking habits of the individual, which have generally extended through many months or even years. The morbid condition of the brain and cerebro-spinal axis belonging especially to the disease denominated delirium tremens, is not one of visible structural change but of impaired nutrition, or impoverishment, coupled with a peculiar morbid susceptibility of the nerve structures, by which the functions of the brain are perverted, and the peculiar hallucinations and incoherences which constitute the essential phenomena of delirium tremens are induced.

Diagnosis.—But little need be said in regard to diagnosis, as it seldom happens that the history of these cases is not easily ascertained, and the peculiar character of the mental hallucinations, coupled with muscular tremors, following directly upon a course of alcoholic dissipation or of the excessive use of other intoxicants, leave very little room for doubt as to the true nature of any given case.

Prognosis.—The prognosis in delirium tremens, whenever it can be brought under judicious management in the early part of its progress, is favorable; yet some cases, especially when complicated with more or less active gastritis or duodenitis will terminate fatally under any treatment. They constitute, however, only a small percentage of the whole number, and aside from these and a still smaller number that have been met with, complicated with direct inflammation of the membranes of the brain, there is almost a uniform tendency to recovery. Probably forty-nine out of every fifty cases of ordinary delirium tremens not complicated with gastritis or meningitis would recover with no medication under simply careful nursing, rest and nourishment. Yet, such is the distressing nature of the delirium, the fear that it impresses upon the patient himself and upon his friends around him, that it becomes desirable, and indeed necessary in the great majority of cases, for the patient to be placed in the hands of a judicious physician, who may pursue some apparently definite and well-considered treatment. When they are not complicated as I have just said, the indications to be fulfilled in their treatment are very fully embraced in two words—rest and nourishment. So soon as the patient can be induced to commence even very brief periods of natural sleep and the processes of digestion and assimilation of food sufficient to begin the work of repairing tissues, just so soon he commences to enter upon his convalescence, and continuance of rest and nutrition will soon restore him to health. If possible, the management of a case of delirium tremens should embrace the service of a judicious and kind, yet courageous and patient nurse. This is of very great importance, as nothing is worse for a patient under the excitement of delirium tremens than having a dozen frightened individuals about him, endeavoring to

hold him by main force, and constantly arguing with him in an excited manner, to convince him that his hallucinations are only imaginary. All such management only makes him more excited, and aggravates the disorder in a very marked degree. One or two self-possessed, cool, deliberate and kind persons, who will take turns with each other and be with the patient continuously, and instead of arguing about the delusions of the patient simply proffer their services to aid and protect him from his supposed enemies, thereby quieting and encouraging him with as few words as possible, and when any positive restraint becomes necessary insist upon such only as is actually required to prevent him from self injury, and let even that much be done as far as possible under the pretext of protecting the patient from the snakes and hobgoblins that haunt him, and he will sooner sink down in weariness to rest, than by almost any other influence that you can bring to bear. From medicines, in nearly all the cases only two influences are needed; the one quieting or sedative to the excited condition of the nervous system, and the other calculated to increase the steadiness and force of the heart's action. I know of no agents that fulfill these two requirements in a more reliable manner than suitable doses of the bromides and digitalis. The first act as pure sedatives to nervous excitability, and the latter increases the force and lessens the frequency of the cardiac action, and also aids the quieting of the bromides. For many years past I have treated nearly all the cases of delirium tremens that have come under my care with these two remedies aided only occasionally by the addition of chloral hydrate at night. Generally the chloral has been needed only during the first two or three nights. A very common prescription is bromide of potassium twenty-five grammes (ʒ vi), tincture of digitalis twenty cubic centimeters (fl. ʒ v), simple elixir, sixty cubic centimeters (fl. ʒ ii), and water sixty, (fl. ʒ ii) of which I give four cubic centimeters, or a good-sized teaspoonful in a little additional water every two, three or four hours, according to the degree of excitement and mental agitation exhibited by the patient. In the early stage, when the patient does not become sufficiently quiet by these remedies to get some sleep, I add from ten to thirteen decigrammes (gr. xv to xx) of chloral about eight o'clock in the evening, and if the patient is not asleep by ten o'clock repeat the dose. I seldom give more than these two doses during the early part of each night for the first three nights, but continue the bromide and digitalis at the usual intervals, except not waking the patient out of sleep to take medicine after sleep is once induced. By pursuing such a course I have very seldom found a failure in steadily diminishing the phenomena of the disease, and after the first three or four days the chloral could be discontinued entirely, and the bromide and digitalis continued at intervals not oftener than once in four or six hours. In some of the cases at the beginning of the treatment, the tongue is found coated, the urine scanty, and there is a slight elevation of the temperature, indicating slight feverishness and general derangement of the secretions. With such, in addition to the treatment just described, I have given two or three alterative doses of calomel, following it by a laxative, sufficient to move the bowels. These remedies usually remove the feverishness, correct the derangements of secretion, and more readily bring the stomach to a condition for tolerating and digesting such food as may be necessary. Sometimes in the wildness of delirium of the patients it is difficult to administer medicine with any regularity. They occasionally become suspicious of those around them, thinking they are trying to poison them with every dose that is given. Consequently, the attendants are apt to become discouraged in their efforts to administer either medi-

cine or food. In such cases great benefit may be obtained by hypodermic injections of morphine either alone or tempered with atropine, sufficient to give the patient quiet, and often before the delirium is renewed you may succeed in the administration of other remedies and some nourishment. In some instances support can not be accomplished by injections, because it is found as difficult to use injections during the delirious condition as it is to give medicine by the mouth. I do not use opiates in the treatment of delirium tremens, except in those cases where, as I have just remarked, I find it impracticable to get them to take medicine sufficiently regular by the mouth or rectum to get the effects needed. In such instances the temporary use of morphine becomes almost absolutely necessary. But great care should be exercised in using hypodermic injections of morphine lest the quantity thus used should produce too profound narcotism, more especially if given soon after full doses of chloral hydrate have been taken, so that when once quiet the patient gets the full toxic effect of both remedies and sinks into a sleep from which he never awakes. I have known several cases in which this result has actually been obtained much to the chagrin of the attending physician. Quiet, careful attention to ventilation, watchfulness, gentle nursing and the simple remedies I have just indicated, have been sufficient in my own hands for the last twenty years to conduct every case of delirium tremens to a safe recovery which has come under my control either in the hospital or out. There are many other remedies that may be used with advantage, but I know of no qualities that they possess superior to those I have indicated, and none more readily adjusted accurately to produce the effects needed. The patient must be just as intelligently supplied with proper nourishment and in proper quantities as with any of his remedial agents. If either is to be preferred the nourishment is the most important. It should be plain, easily digestible and readily absorbed, or convertible into elements of blood with but little active gastric digestion. For the larger proportion of these patients have but little normal gastric secretion and frequently considerable irritability of the gastric mucous membrane, so that nourishment should be given in very moderate quantities and usually in a liquid form until the patients begin to recover. Beef tea and other animal broths properly seasoned with salt, milk, lime water and milk, oat meal gruel and milk, rice and arrow root, are among the nutriments best adapted to these cases. As soon as they manifest a disposition to have other food they may be supplied with any ordinary plain food in moderate quantities as fast as the appetite demands it. They should be carefully guarded against too early returning to severe mental and muscular exercise; and especially should they be cautioned against ever returning to the use of alcoholic beverages; for every attack of delirium tremens evidently leaves the nervous system in some degree predisposed to another attack. Consequently, the patient more and more readily induces these attacks by repeating his potations, till sooner or later, complications spring up in the form of gastritis and sometimes meningitis; or there supervenes in connection with the drinking habit, fatty degeneration of the liver and perhaps sclerosis of the kidneys, and in the midst of the delirium sudden suppression of urine inducing uræmic poisoning, convulsions and death. While on this subject of delirium from the use of intoxicating drinks, we might pass directly to the consideration of what has been denominated methomania or dypsomania; but, if such a form of disease exists, it is a species of mental derangement that will be more appropriately alluded to in the brief review I shall make of mental derangements in the next one or two lectures.

LECTURE LXXXII.

Mental Derangements—Their Varieties, Causes, General Characteristics and Pathological Relations.

GENTLEMEN: Under the head of mental derangements, I shall not attempt to direct your attention to a full consideration of the various forms of insanity and impairment of mind which might be included under so general a designation. The subject of insanity in its relations to the individual, to the community and to the State, is so important and in some respects so different from other classes of disease that it has been very generally considered in separate treatises, and in modern times often entirely omitted from works on general practice. I have not thought it best, however, to pass the subject without a very brief consideration, aiming to make it such as would assist you, as general practitioners, in recognizing the early stage of the different forms of insanity, and in comprehending the causes most likely to produce these disorders, that you might be prepared to render such patients a reasonable degree of assistance at that early period when medical attention and care has the best chance of success. A glance at medical literature will show that there are two prominent and distinct modes of viewing the subject of insanity. The one which was predominant until within the last few years, considers the subject from a psychological or philosophical standpoint almost exclusively, paying little attention to its connection with any disorder of the brain or nervous system. The other regards the mental derangements as in a great measure, if not wholly, the result of prior and coincident derangements of the physical organs through which mind is manifest, *i. e.*, the brain and its appendages. It is probable that neither of these extreme views are correct, and yet there is a valuable amount of truth in both. If you study the causes which are known to favor the development of mental derangements, you will readily observe that such causes are divisible into two classes; one class is addressed almost exclusively to the mind itself and may be said to be purely mental; the other acts with equal directness upon the physical organization, and consequently reaches derangements of the mind, necessarily through changes in the physical structure. You will remember that at the last lecture in alluding to the form of mental derangement called delirium tremens, which is caused almost exclusively by alcoholic drinks, that the physical agent, alcohol, makes its impression upon the structures of the brain and nervous system as well as upon the other organs of the body, and induces those changes in the nutritive functions that render the brain incapable of manifesting mental action in a coherent and natural manner, there can be no doubt. This would serve as an example of all that class of agents which act through the physical system in producing modifications in the properties or structure of the brain in such a way as to disorder the mind in its manifestations. On the other hand, persons who may be, as far as can be determined, in the most perfect physical health, if subjected to causes that operate primarily and entirely upon the mental faculties, emotions and passions may, by persistence, develop derangements quite as certain and as serious in their character as any causes that act more directly through impressions on the physical structures. It is only rarely that sudden and transient impres-

sions upon the mental faculties and emotions, however intense they may be, have produced actual mental derangements, but it is those causes which act more or less intensely and persistently through considerable periods of time which are most likely to result in actual disorder to the mental faculties or in some form of insanity. Among the causes that act upon the mental faculties may be enumerated prominently, persistent cares and other depressing mental emotions long continued; intense mental application directed to some particular theory or problem, such as questions in theology or concerning the future existence, or such questions in philosophy or metaphysics as have the power to concentrate some particular intellectual faculties so intensely as to interfere with regular sleep. The mind thus occupied with a special train of thought through many days and nights in succession is one of the more common causes of mental derangements. Those misfortunes consisting in loss of property, changes in domestic circumstances and disappointment of affections, when of such character as to cause loss of sleep and persistent dwelling upon the same thing, are extremely liable to produce mental disorders, and are all of them addressed in their action to the mind itself. On the other hand not only the use of alcoholic drinks, but a variety of narcotics and anæsthetics and the existence of certain diseases, are capable of producing such an influence on the brain as to disorder the mental manifestations. If the whole series of causes which favor the occurrence of mental disorders are examined closely and analytically, it will be found that a large proportion of those which are addressed to the physical system, such as the narcotics, anæsthetics and other physical agents that are capable of producing mental disorders, are characterized largely by impairment of the mental faculties rather than the establishment of permanent derangements of the intellect, although the latter often exist in the early stage in a prominent degree. After this stage is passed, however, if the phenomena do not cease entirely, they are more likely to be resolved into mental impairments tending toward imbecility or mental incapacity rather than into intellectual hallucinations or insanity proper. While the class of causes that are addressed to the mental faculties direct, are very liable to produce the reverse result, namely, permanent hallucinations, illusions and reasoning from false premises, yet often maintaining much acuteness and quickness in their mental processes through a series of years.

Varieties of Insanity.—The laws of England and of most of the States of this country recognize two varieties of insanity, diagnostically called in the English law, *dementia naturalis* and *dementia accidentalis*, corresponding with the more common words idiocy and lunacy: *dementia naturalis* meaning idiocy from birth, while *dementia accidentalis* includes all those cases that arise from any cause after the mind has once been developed to activity. Those included under the second class, *dementia accidentalis*, or lunacy, may be further divided conveniently for purposes of diagnosis and recognition into two subdivisions, namely, *mania* and *monomania*. Cases of dementia naturalis or idiocy are also divisible into two subordinate classes which may be designated as dementia, and amentia. The first meaning impairment of mind, and the second, absence or complete loss of mind. Of course there is no clear line of demarkation between these two subordinate divisions of the class of idiots, for they manifest all possible stages or grades of mental impairment, from that which falls only a little below the regular order of intellect, to that of complete absence of all manifestation of intelligence, constituting the amentia. The division of the second class into mania and monomania is founded upon the fact that there are many of the insane who manifest derange-

ments of the mental faculties generally, and are not able to control the mental processes, so as to reason correctly upon any subject. While there are many others who reason correctly, and as far as can be detected manifest all their mental operations in a natural manner in relation to all subjects and processes except perhaps a single topic on which they reason altogether incorrectly. The mind is said in such cases to be deranged upon one subject, or upon a particular class of subjects, while it is apparently unaffected in reference to all other subjects. You will mark that this derangement is limited to some particular topic or class of topics and not limited to some particular faculty of the mind. This distinction has not always been kept in mind, and has led to the idea that the mind is capable of being deranged in one or two of its faculties and not in others. I have seen no specimens of that character. But the mental derangement in regard to particular topics or particular subjects is of very common occurrence. The recognition of monomania, or derangement in relation to particular subjects has led more recently to the multiplication of forms of insanity to a degree which has seemed to me excessive. An effort has been made to show the existence of actual mental derangements as the cause of a large portion of the criminal practices existing in the community. Once recognizing the liability to derangements upon particular topics or subjects of thought, the attempt has been made to explain many atrocious criminal acts on the theory that the party committing those acts was insane on the subject relating to them. For instance, the taking of property, or theft, has been recognized as a form of insanity called kleptomania. The disposition to recklessly set fire to buildings has been regarded as pyromania or as a form of insanity or insane impulse to commit arson. The exhibition of sudden and violent anger to the extent of committing violent assaults and sometimes murder, has been explained by alleging the existence of impulsive insanity. But if you adopt the reasoning of a considerable number of specialists of the present time in the department of psychological medicine and carry it to its logical results, you will be led to a position from which you will be wholly unable to maintain a line of distinction between crime proper and the freaks of insane impulses, and the special mental derangements upon particular subjects. And you will be compelled, as some have already done, to regard all crime as only the result of mental derangements, and further that such mental derangements are founded upon faulty physical organization.

Of course such a position involves a denial of the justice of all punishment, as well as an obliteration of all distinctions between virtue and vice and between right and wrong. I make these allusions to prevalent tendencies simply to put you on your guard against being led by such reasoning to excesses, and not by any means to discourage close and careful investigation. Very many attempts have been made to give a definition of insanity. A well known writer on mental philosophy, John Locke, defined insanity to be, reasoning correctly from false premises. The equally celebrated Dr. Abernethy of London, defined insanity to be the loss of the faculty of attention; while Dr. Connolly, having much experience personally in the care of the insane, defined the disease to be, loss of the power of comparison and judgment. It requires but a moderate amount of familiarity with the insane to perceive that all these definitions are correct when applied to certain classes of the insane. You could hardly enter any asylum for this class of individuals containing a score of patients, without finding some of them who would reason as acutely as the best trained intellects are capable of doing, making all their deduc-

tions in strict harmony with the premises that they assume. But the premises themselves would be false. Consequently their deductions lead them into error, constituting their derangement. Others would be found among a similar number who would exactly correspond with Dr. Abernethy's definition, that is, loss of the power of attention. The mind would flit from topic to topic, notwithstanding all your efforts to fix their attention upon any one train of thought. Such individuals are common among those who are laboring under mania or general insanity.

Perhaps there is no more prominent symptom among them than this inability to fix the attention so as to hold any two trains of thought, or to keep the mind upon any two objects long enough to make a comparison or deduction. And equally easy is it to find in a limited number of the insane those who would correspond with the definition of Dr. Connolly, the loss of the power of comparison and judgment. Indeed, this, when you analyze it, hardly differs from that of Dr. Abernethy. The loss of the power of comparison is nothing more nor less than the loss of the power to fix the attention long enough upon two objects or two trains of thought to make a comparison. Of course, there can be no judgment or inference where the attention can not be fixed long enough to allow of a comparison. The comparison of different things and trains of thought is an essential requisite to the forming of a conclusion or judgment. Perhaps one of the most practical distinctions to be made in the classification of mental derangements consists in drawing a line between those persons who are insane and those whose mental unsoundness consists directly in impairment in one or more of the mental faculties, which would cause them to be properly called weak or incapable, but in the operation of whose mind there is no apparent illusion, false impression or hallucination, and consequently not any drawing of erroneous conclusions, or what is diagnostically called delusions, but simply impairment in the readiness of mental action. Such cases exhibit slowness of thought and of speech, difficulty apparently for the mind to continue a train of thought, as exhibited frequently by losing it in the midst of a sentence and being unable to finish it. Such patients constitute a class that may be properly styled incapacitated or unsound in mind, but not technically insane. The other class would consist of all those whom I would call, technically and properly, mentally deranged or insane; not simply weakened in mental action, but the mental processes more or less actually turned out of their normal channels of operation. And I think all without exception belonging to this class are, when the mental disorder has become well established, affected with certain mental phenomena, which may be ranged under three heads, namely: illusions, hallucinations and delusions. By illusions I mean an erroneous conception of a real object. Perhaps one of the most common that you will meet with is the illusion that the individual who is insane is himself some person entirely different from his real character. It may be the illusion that he is a king, a popular officer, a beggar, or the maker of the universe, constituting an illusion in reference to the real object, but perverting the character of that object. Or it may be an illusion concerning objects not personal, but of a strictly material character disconnected from the individual, as when the friends or individuals around or connected with the insane person are regarded by him as persons entirely different from what they really are; giving to each of them a name and character that is purely fictitious. The illusion may consist in the impression, fixed and indelible, that the composition of the body is entirely different from that which is natural. For instance, a lady of very high

rank in England, in former times, is reported to have labored for years under the illusion that her own body was made of glass, rendering her extremely reluctant to have any one approach her through fear that such contact might break her to pieces. Particular articles of furniture are liable to be invested with illusions of the same character. The sense of taste and hearing also, as well as sight may be the seat of similar illusions, as when sounds are construed entirely different from what they really are, and sweet substances are thought to be sour and sour sweet, or bitter palatable. By hallucinations are meant the conception in the mind of the insane of the presence or proximity of bodies or phenomena that have no real existence, as the hearing of noises and conversation where no such exist. Hallucinations may equally reach the mind through the organs of vision and lead to the supposition that objects, animals, friends or other parties are present, and apparently to their conceptions really present before them, that have no existence, while delusions are the conclusions or judgments that the insane person forms from the influence of these illusions and hallucinations. Acting and thinking as though the hallucinati ns and illusions are real, the insane person is of course led to erroneous conclusions, and from erroneous conclusions to delusions and erroneous acts, not infrequently of the most injurious and dangerous character. There are almost all forms of these illusions and hallucinations of which you can conceive. And not infrequently they take the form of jealousy or the investing of certain parties with false attributes, perhaps investing their very best friends, members of their own families, with the qualities of an enemy, conspiring with others to invade the domestic circle, rob them of their property, or do them bodily injury.

Of a similar illusory nature is that form of insanity which causes the husband to attribute to his wife want of fidelity, and to put a false construction upon almost every movement that she makes, or the wife the same in regard to the husband, to such a degree that the suspected party can not transact the most trivial business with other parties without almost every word and act being construed in a false light, or regarded as evidence of some criminal intention. These are usually classed under the general head of jealousy, yet they are all resolved either into illusions or hallucinations. But I said in the beginning that one of the leading objects in alluding to this subject of insanity, was to call your attention to those symptoms and conditions which characterize the forming stage of insanity and their diagnostic value, that you might be the better prepared, not only to detect the existence of mental disorders early, but also by early and judicious treatment to arrest its progress and save the individual from so great a calamity as the full development of mental disorder. And this leads me to a brief review of the symptoms and progress of some of the chief forms of insanity from their incipient beginning to their full development.

Symptoms.—Perhaps one of the earliest and most important symptoms of the approach of insanity consists in a marked change in the individual from his ordinary or natural mode of thought and demeanor. A marked alteration in this respect is always worthy of notice. Among the very earliest symptoms are, with one class, the manifestation of self-conceit, or assumed importance or positiveness that is unnatural to them. Another class, instead of exhibiting self-conceit and arrogant assumptions, show a degree of despondency, distrust and indisposition to freedom of conversation, or manifest a desire to remain silent to a degree quite unnatural and contrary to their usual habit. Perhaps a still larger class show their first manifestations by distrust or suspicion of some particular party or some

limited number of parties, or at times in reference to everybody, causing them to act every day as though making an effort to conceal their suspicions. Yet by a very moderate amount of intercourse their attempts at concealment fail, and they soon betray the distrust or suspicion which they evidently feel, and which is persistent with them from day to day, causing them to be apparently non-communicative and reluctant to speak of their plans, their movements, or anything that pertains to the object of their distrust. With all these changes from the natural condition of the individual as early traits, there is almost invariably an impairment of the ability to sleep. Their nights become disturbed and wakeful. If they retire as usual, they do not sleep. They are forced to get up much earlier in the morning, sometimes in the middle of the night. These changes from the natural condition, or tone of mind and feeling in any direction, maintained through many days or weeks in succession, should always lead to a careful consideration of the causes, and it will seldom fail to prove the precursor of some form of mental derangement. If to these slighter and more obscure alterations from the natural mental condition of the patient we add somewhat uniform wakefulness at night, sometimes a continuous pain in the head, and the manifestation of unusual despondency without adequate cause, or on the other hand, undue excitement, equally without adequate cause, with occasional expressions indicating a suspicious disposition, or an unusual interpretation of the acts of others, perhaps of intimate friends, it will show not only that mental derangement is approaching, but that it has already commenced. And if these deviations simply continue to increase from day to day, the reasoning faculties will soon so far loose their control that the illusions or false conceptions formed in the mind of the patient will inevitably betray him into the more open manifestation of insanity. The cases that have already been alluded to, are those which commence slowly, and usually lead to what may be termed chronic forms of mental derangement. They may persist in their development till the mind becomes deranged upon all subjects, constituting general insanity. Or, the insane trains of thought may be confined to particular topics, and remain there throughout the whole course of the disease, constituting partial insanity or monomania. The disease may present a great variety of deviations. After the individual has been led into the first deviation from the natural train of thought he will very generally assume, and act upon the idea that some particular individuals or agents have caused that train of thought, and this will give character generally to all the subsequent insane developments; the derangement of mind will be limited to these individuals or topics. It may take the direction of extreme depression, under the impression that they are lost; that the day of salvation or any future happiness for them has gone by; or it may take the opposite direction, that of being elated with the idea that they are already passed into the state of perpetual enjoyment, or that they are some high religious dignitary, dispensing happiness to others. Cases of the first kind are much more numerous than the latter, and constitute some of the most typical instances of insanity that we meet with.

Another very frequent train of insane thought has reference to the character and actions of the patient's most intimate friends, and has for its basis, jealousy or suspicion. It may relate to property, the suspicion being that certain parties are in conspiracy to deprive them of their property. And in relation to that topic no amount of reasoning can correct their delusions, while upon all other subjects they will converse and act as rationally as other parties. The suspicion may fall upon some mem-

ber of their own family, the husband suspecting the chastity or conduct of the wife, or the wife that of the husband not only in relation to fidelity to the marriage contract, but in relation to their being in conspiracy with other parties to put the patient out of existence. The suspicion not infrequently fastens itself upon their most intimate friends or family relatives. And under such circumstances often the first manifestation of their illusion is a refusal to eat under the suspicion generally that what is prepared for them has been poisoned. They will refuse to eat at first, often without acknowledging why. For the same reason they will often refuse to take medicine through fear of being poisoned by it. Often they will remain awake the greater part of the night, watching for some anticipated movement against themselves by the parties they suspect.

LECTURE LXXXIII.

Mental Derangements Continued—Clinical History, Diagnosis, Prognosis and Treatment.

GENTLEMEN: At the close of the preceding lecture I was directing your attention to the various phases of insanity. There is hardly a topic that ordinarily occupies the human mind but what may become the subject of insane delusions, constituting what is denominated *monomania* or partial insanity, while on all other topics the individual retains his usual correctness of mental operations and maintains very good general health in many cases for years. If you choose to look through the special works upon insanity or the treatises upon medical jurisprudence, in the chapters devoted to insanity in its various forms and relations, you will find the details of many interesting cases of the various forms of monomania. As I said before, these forms do not always affect the reasoning or the intellectual faculties but are sometimes confined to the emotions and passions. And when thus confined they are capable of producing erratic and sometimes highly criminal acts, which are difficult for those who have not made the matter a subject of study to understand or excuse. The individual retains apparent appreciation of right and wrong and his power of reasoning as well as ever upon almost every topic, and yet is subject to certain impulses apparently beyond his control, of a criminal character. I allude now to those impulses which have been manifested to commit assaults upon other parties, as in the case of a sudden impulse to destroy life or commit murder. This, however, is not always explainable upon a sudden impulse, but sometimes originates from an insane impression of having received a direct command from the deity, as when a father kills one or more of his children under a direct impression that he is ordered to do it by the deity and can not help himself, or as in a case that occurred in this city only a few years since, where a father who had been deranged upon a general or religious theme and who had been properly adjudicated insane and confined in an asylum, was thought by the superintendent to have recovered and consequently was allowed to return to his home. Within a few days after his return, however, he deliberately killed his wife in open day, under the fixed impression that he was commanded by the deity to sacrifice the dearest object of his affections. And as that was his wife he deliberately proceeded before her

face to shoot her dead. That this was an insane act purely, there can be no doubt. Many cases have occurred of the destruction of wife, children or members of the family, under delusions operating upon the mind in a similar manner.

We may explain sometimes possibly, the acts of criminals in committing arson or murder, through the processes of mental derangement. But it requires very great care to distinguish between the actually insane in these cases of emotional or impulsive insanity, and those of true deliberate criminality. For such differences, however, I must refer you again to that portion of works on medical jurisprudence, which treat of the criminal relations of the insane. When insanity has approached in a slow, obscure manner as I have described, and has finally established either general derangement of the mental faculties, or a limited derangement having reference to particular topics and trains of thought, there is little tendency to any self-limit in the progress of the affection, particularly so long as the objects which are the subject of the insane thought are within sight or proximity of the patient. If they are separated entirely from such relations and placed at an early period under the control of strangers, as when removed to institutions especially for the care of the insane, a large proportion are capable of recovery. The proportion will be much larger than if left within the circle and in near contact with the individuals and circumstances under which the derangement first developed. Cases of general insanity often originate in a sudden and acute manner as I have already indicated, especially when the exciting causes are such as act with a high degree of intensity upon the mind. For instance, when the mind receives some violent shock, as in sudden loss of large amounts of property or of immediate relatives, or when they are placed in circumstances where they are under great mental apprehension of some disease, or the approach of some sudden accident, striking terror; in all such, the intense mental impressions are capable of producing the most sudden and rapidly developed general derangement of the mind, so rapid sometimes that the individual passes almost immediately into a state of frenzy, with loss of all control over the intellectual faculties, constituting general acute mania. In such cases the symptoms are often very violent. The individual exhibits a wild or excited expression of countenance, often manifesting the most violent outbursts of temper and emotion, ready in some instances to assault their best friends with the utmost violence, or, in their terror, to plunge themselves without the slightest hesitation from windows at any height above ground, where the fall would be immediate destruction, and without any disposition to sleep for many days and nights in succession. These are cases of acute general mania and yet amidst it all, you can generally trace certain hallucinations and illusions that are the basis of their derangement.

Another form of acute general mania is that which attacks lying-in women and is called puerperal mania. The disease frequently develops within a few days after confinement, but in some cases not until several weeks have elapsed. The first indications of the approach of this form of disease are simply change in the individual's modes of expression and thought, saying things that are odd and unusual for them, refusing to take nourishment and unable to sleep at night. These symptoms usually progress so rapidly that in from one to three days the patients are found to be in a condition of general mental derangement. They are almost always suspicious of those immediately around them, so much so that it is extremely difficult to induce them to take sufficient nourishment through fear of being poisoned by their supposed enemies. In almost all cases of

acute general mania the patient becomes rapidly reduced by the refusal to take adequate nourishment, the want of sleep, and the constant mental excitement, as indicated by their becoming more pale, the pulse quicker, softer, more easily compressed, the extremities often cold, and in the most severe cases this exhaustion will continue to increase unless they are relieved by appropriate treatment until it reaches a fatal termination; sometimes in the course of one or two weeks, but more frequently not till the end of five or six weeks. While some cases will thus run through an acute course to a fatal result, far the larger number after the first two or three weeks become modified in the intensity of the mental derangement, so far that the patient catches now and then short periods of sleep, more nourishment is taken and the physical system is consequently sustained while the mental derangement goes on in what may be called a chronic form. In such cases after assuming the chronic form as well as in those that may be said to be chronic from the beginning, there is a tendency to ultimate atrophy and impairment of nutrition especially in certain portions of the cerebral substance. Perhaps the parts most frequently involved where atrophy and wasting can be detected, or in the acute cases that terminate fatally at the early period where hyperæmia and increased vascularity are most noticed, are in the central ganglia, especially the corpora striata optic thalami, and to some extent the gray matter upon the surface of the cerebral hemispheres. The parts least affected are the posterior portions of the cerebrum. In long continued, general insanity, there is in most instances a noticeable degree of atrophy of some portions of the cerebral substance, more particularly of the gray material, either of the convolutions upon the hemispheres or the ganglia at the center as I have already mentioned. This atrophy has sometimes extended through the medulla to the lateral gray matter of the spinal cord and become associated with general atrophy of the muscular system, constituting what I have already alluded to when speaking of the inflammatory affections of that portion of the cord as the general atrophy of the insane. This brief outline of the premonitory symptoms and the more prominent phenomena accompanying the different degrees and stages of insanity, and the tendency of the disease either to assume the chronic form or to lead to such changes as may terminate early fatally, are sufficient to give you that degree of knowledge which every practitioner of medicine should possess. As I have before intimated a whole lecture could be readily taken up in describing the different phases of mania and monomania without exhausting the subject.

Pathology.—I have just stated to you that where death takes place during the progress of acute mania, there is usually found more or less hyperæmia or accumulation of blood in the vessels of the convolutions upon the hemispheres of the brain, and in the corpora striata and other portions of gray matter at its base. The microscope reveals still further molecular disturbance in the structure of the parts where the most hyperæmia exists, probably closely analogous to the ordinary changes that accompany inflammatory action; and in those chronic cases that have been of long duration, the anatomical changes as previously remarked are those of atrophy or diminution of nerve structure, with perhaps some slight degree of sclerosis or hypertrophy of the connective tissue. And in very many cases where death has taken place by some accident during the progress of ordinary cases of insanity, both general and partial, a close scrutiny from dissections, and from microscopic examinations, have failed to detect any characteristic lesion in the nerve structure or any part of the nervous centers. And I am compelled to admit that many cases of insanity are

not explainable from any recognizable change or disease in the physical structures of the brain and parts with which the mind is associated. I do not mean that all insanity is unaccompanied by these physical changes. I am well satisfied that there are many forms or cases of insanity that have their primary origin directly in the structural changes as the starting point of morbid action, but there are others in which the primary impressions are upon the faculties of the mind, and whatever changes take place in the physical structure of the brain are secondary, or the result of the persistent disturbance of function, and not primary as the cause of that disturbance. In other words we may have mental derangements from causes that influence mental action alone as the primary departure from the healthy standard independent of any prior structural lesion. I am aware that some of those occupying high positions and justly regarded as authorities, hold to the doctrine that there is no such thing as a diseased mind, independent of morbid conditions of nerve structure. But certainly no facts derived from actual examinations, with all the modern appliances for making such examinations minute, have yet been developed sufficient to justify that conclusion.

Prognosis.—The prognosis differs much in accordance with the kind of insanity and mental derangement that exists, and its mode of origin. A large proportion of acute cases are susceptible of being conducted to a reasonably early recovery. To this class belong those of puerperal mania, nearly all of which, under favorable circumstances and judicious management, ultimately recover. Perhaps not quite to so great an extent, and still sufficiently so to include a majority of cases, those arising from causes that are temporary or of short duration, however intense in their operation at the time. The cases which are most likely to be persistent and to resist treatment are such as come on slowly from causes that act with only moderate degree of intensity, but persistently through long periods of time. They consequently develop the mental derangements in the manner that I first described, so obscurely, that the attacks are hardly noticeable until weeks and perhaps months have passed by, and where the causes still exist, and the individual is left within the reach of their influence. Another element which influences the prognosis is that of hereditary predisposition. As a rule those cases of insanity that are induced by temporary causes without any previous hereditary predisposition on the part of the patient are much more likely to recover than where any strong family tendency or hereditary influence favors the development of the disease. The latter influence also tends greatly to induce relapses after recovery or partial recovery has occurred. Notwithstanding, it may be said as a general rule that the prognosis in any given case will be improved or made favorable, just in proportion as the patient can be taken under the most judicious management early in the progress of his disease, and separated as completely as possible from all association with the individuals and circumstances under which the disease was developed. Consequently it is of very great importance that insanity be detected early, and that the most efficient and judicious steps be taken for counteracting it by removal of the causes or the removal of the patient from their further influence, so far as it is possible to do.

The timely administration of such remedies as may have influence in counteracting the early symptoms of the disease is also important. Each individual case must be treated upon its own merits. The almost constant tendency of the insane to refuse medicine and defeat all efforts at its administration at regular intervals while left under the control of friends or ordinary nurses, and the continued action of the causes that have

given rise to the disease, make it desirable to remove the patient to other places, and in association with entirely new parties, just as early as they possess the symptoms or give positive evidence of the existence of mental derangement, whether it be general or partial. And often after the mental symptoms that I have pointed out to you are recognized, if judicious measures are taken as far as possible without betraying to the patient the suspicion that mental derangement is approaching, and at the same time the closest and most careful attention be paid to the physical health of the patient, seeing that the digestive organs are kept in good order, the bowels regular, and if possible from six to seven hours of good sleep secured, the development of the disease will in many cases be arrested at its beginning and all the subsequent evils prevented. Usually the remedies most likely to act favorably by procuring sleep for this class of patients in the forming stages of mental derangements are not opiates; for while they will frequently produce the required amount of sleep, they so far tend to restrain secretions and impair appetite, that they lead to secondary conditions of the system that are more favorable for the further development of the mental derangement, than though the remedies had not been given at all. I have found no combination of remedies that in so many cases produce an amount of quiet natural sleep, with no secondary ill effects, as that of the bromide of potassium, sodium or ammonium in connection with digitalis and hyoscyamus. These three remedies, given either separately or conjoined in he same prescription, so that their effects shall be developed during the evening at such time as would be the natural hour for retiring to sleep, will usually produce a better effect than can be obtained from anything else. After the disease has made a fair beginning, and especially after the sleeplessness is fully developed, the mind positively suffering some derangement, it will often require larger doses than usual to produce the desired effect. But there is little danger in pushing these three remedies conjointly, sufficient to produce the desired effect, if the patient can be induced to take them, or if not they can sometimes be used by enema. In my hands they act much more favorably together than either of them alone. During the periods of high excitement, it may sometimes be desirable to combine chloral with the bromide, but my own observation in the use of chloral has led me to regard it as very liable to be irregular and often slow in developing its effects. I have repeatedly seen it given in full doses as early as seven or eight o'clock in the evening when its effects in inducing sleep did not follow until after midnight, and then the patient awakes in the morning dull, stupefied, and often remains more or less incoherent all the remainder of the day. Aside from the use of such remedies as are calculated to keep the evacuations from the bowels, and the action of the important secretory organs, like the kidneys and skin, free, it is not desirable to trouble the insane with frequent doses of medicine. Simply, either by diet, or by such remedies as will accomplish the purposes I have just named, and the use of those remedial agents that are most efficient in inducing quiet, natural sleep with the least tendency to leave secondary unpleasant effects, administered at the proper time in the evening, and leaving the patient during the day but little annoyed by anything except taking the necessary amount of nourishment, is a better plan than to pursue more active, continuous medication. Equally necessary with the medical treatment is the adoption of the most judicious means for inducing the patient to take the necessary amount of nourishment. And this leads directly to another part of the management of the insane, which is of the utmost importance. This is what may be termed the mental or moral management. More will

depend upon this than all other circumstances combined. A mind that is disordered in such a way that the reasoning faculties do not control the attention, the emotions, passions and trains of thought is not in a condition for argumentation. One of the most common, and most injurious influences that are brought to bear upon the insane, is the disposition on the part of their friends to be continually trying to convince them of the error of their thoughts and delusions, and consequently to keep them excited by arguments till perhaps both patient and attendants become irritated by their mental contest. Any such conversation only aggravates the deranged condition of the patient, and adds to the certainty of prolonging the disease. All the attendants upon the insane should be rigidly required to avoid the least appearance of excitement and of a disposition to contradict and argue. The uniform tendency should be to soothe, encourage and kindly influence the mind of the patient in such a way as to gain his confidence by leading him to think you understand his wishes, and will aid him as far as possible. Even so far humor his impulses and insane trains of thought as may be necessary to gain his confidence, and make him think you are his protector. It is so difficult to get most members of the families interested in the insane to take such a course and assiduously avoid combating what appear to them as groundless fancies, that it constitutes one of the reasons why it is desirable as early as possible after insanity is fairly developed to remove the insane parties entirely from the care of their immediate friends. The same principle that I have laid down for the mental management of the insane by kindness and by seeking their confidence leads to the rule that you should avoid as long as possible the resort to physical force as a means of restraint. The straight jacket and the direct, positive restraint by any species of mechanical appliance of force should be resorted to only in the last extremity, and when no other mode will prevent the patient from a degree of violence directly dangerous to their own existence or that of those around them. It is remarkable to what extent some persons of experience and natural tact will control the insane by mental management alone without the least appearance of restraint or controversy. Such management will do more to secure an early return to a sane condition of mind than all the other influences that can be brought to bear.

As I have often spoken of the removal of the insane from the care of their friends, you will be ready to ask whether it is desirable, as a uniform rule, that they should be removed as early as possible after the insanity becomes clearly evident, to some institution or asylum expressly for their care. I answer, that such a removal to some kind of an asylum away from their friends, and the immediate circumstances under which their disease developed, is necessary and desirable, as early as it is possible to do so. But it is by no means a matter of indifference as to the kind of institution to which they are removed. Much good would result from careful discrimination in this respect. There are very many of the insane, who could be removed with benefit to private asylums, under the care of skillful superintendents and nurses, where there are only limited numbers of the insane under treatment, and consequently where it would appear to the patient much more like a home, than like a public institution, with its surroundings. There are some other forms of insanity, quite harmless, involving no tendency to violence, in which the individuals, if removed from their immediate surroundings simply to some other family or place, where their associations would be different, and where they would be under the immediate care of some person skilled in their management, would do better than in a private asylum. But there are many other in-

sane persons, especially those who are affected with general insanity, who will be better provided for in a public asylum, built expressly for the care of the insane, with all the necessary furniture and attendants for their protection and care, and where every circumstance and surrounding imparts to them a kind of awe or restraint. There is not enough attention paid to the classification of the insane. As I have said, there are some who can be safely, and most successfully treated, on what has been in modern times termed the family or cottage plan, where they can have the aid of other members of the family, and be continually subject to the watchful eye of a judicious attendant. Others will be more properly accommodated in well regulated private asylums in which only a limited number of patients are received. There are some others, as I have just stated, who can be with more propriety assigned to public asylums, if they are provided with a sufficient number of attendants or nurses and under judicious supervision. Perhaps, before leaving the subject of insanity, I should say a word or two in regard to that form of disease which has been denominated by some methomania, or mental derangement consisting in an uncontrollable disposition to indulge in the use of intoxicating beverages. It is claimed by many at the present time that inebriety, or habitual indulgence in the use of intoxicating drinks to an injurious extent, is a disease, rather than the result of vicious habits. There are others who place great importance upon what is termed the hereditary disposition to inebriety. They teach that in a large portion of those who become habitual drunkards, either periodically or continuously, that such habit is the result of a defect in their organizations derived more or less directly from hereditary influence, developed by the same habits in their ancestors. Of course the inference of such, is, that the inebriety being the result of physical conformations, or morbid conditions of the nervous system, it is to be treated as such. The fact that there are very many persons in the most civilized communities, who develop at an early period of adult life a remarkable disposition to indulge in the use of intoxicating drinks at certain periods of time, constituting what are known as periodical drunkards, is familiar to every one, and they constitute enigmas to most people. They will abstain entirely from the use of all intoxicating drinks, be apparently in good health, attentive to all their duties and industries every day, for from one to six months perhaps, and then without any visible cause go directly into the period of drinking, keep themselves in a state of daily intoxication, usually till their digestive organs become so deranged and irritated as to cause them to reject their drink, as well as their food, and thus compel them to desist. Others stop simply because their money is exhausted, and perhaps end in either threatened or actually developed delirium tremens, or there are many, as explained, who, having nothing further to buy drink with, would be compelled to desist for a few days. In either case, having stopped until sober, they resume their ordinary diet, soon return quietly to their work, and are apparently as free from the disposition to drink again for a similar period as any other person in the community. These periods of dissipation or inebriety usually increase slowly in frequency with each individual, so that parties who would have at first only one of them in a year, in process of time come to have what they call their drinking sprees every three, four or six weeks, till it completely destroys their ability to maintain their position in society, or to carry on their business successfully, and they consequently become ruined, both in health and in their social and pecuniary relations.

It is a mystery why an individual after frequently experiencing all the

evil effects of drinking, again and again, should be able to abstain rigidly and apparently without effort for months at the time, and yet persistently return at stated periods to the same practice and undergo the same evil effects. There is, no doubt, some obscure, but persistent morbid condition of the central portions of the nervous system in these cases. When the habit has become fixed, such individuals should be provided for by proper legal enactments, by which they can be so far restrained legally, as to absolutely prohibit their obtaining intoxicating drinks or indulging in their use when their paroxysms, or disposition to do so, shall come on. There is just as much propriety in doing this, as there is in restraining a person insane in any other way or in any other form. Because these periodical drunks are, as has been proven over and over again through the generations that are past, dangerous both to the patients and the communities in which they live, and on the principle of danger to themselves and the community, they become proper subjects for legal restraint. The same rule in reference to legal restraint applies more forcibly to inebriates who become habitually and continuously subject to inebriation, just as certainly as the means for gratifying their unnatural desire is within their reach. You might as well expect a horse to refuse to put his nose in a manger to eat his oats when he is hungry, the oats being there, as to expect one of these confirmed habitual inebriates to abstain from taking his drink, while left with drink directly before him. He may reason and resolve to take no more than a swallow, but the moment this has reached the brain the appetite implanted in his perverted nervous organization is started and drink will be taken in spite of any number of resolutions and pledges. I am speaking now only of those who are confirmed habitual inebriates. There was a time when those of this class, and all the classes of periodical drunkards, had power of self-control if they had chosen to exercise it; for admitting that there may have been some defect in their physical organization that constituted a predisposition or weakness, and made them more ready to succumb to the influence of alcohol, more ready to acquire what is called a taste for it, still after admitting all this, in the early stage of their progress these parties are capable of self-control and of abstinence, as proved by the voluntary reform of thousands. Even their predisposition does not consist in any taste for alcohol. There is, indeed, no special taste for any particular article of drink whatever. The predisposition consists simply of that kind of nervous weakness or feeling of exhaustion or readiness to be made weary, that makes them desire something to relieve such feelings. The sensations themselves are no more suggestive of whisky than of milk or bread; it is only by trial or actual experience that such parties learn the anæsthetic effects of alcoholic drinks in diminishing their morbid nervous sensations to a greater extent than the effects of milk or water. Having acquired this knowledge by trial, they resort to it again and again; and each time they resort to one of these agents, its anæsthetic influence helps to produce secondarily the very weakness that originally constituted their only defect. The great error which helps to keep up the resort to alcoholic beverages, of whatever kind, whether fermented or distilled, to remove a conscious weakness, the result of a condition of the nervous system in persons of defective natural developments or of special hereditary tendencies, is the universal practice of speaking of alcoholic beverages as stimulating and supporting agents. This is the idea inculcated from infancy up by the common language of every household as well as by the larger proportion of the members of our own profession. And it is this idea in the minds of the great majority of individuals, whenever weakness, weariness or physical discomfort exists,

that at once suggests the alcoholic preparations as the agents they need to relieve their discomfort. And the deception is readily confirmed in them by the temporary anæsthetic effect of the alcohol in diminishing the sensibility of the brain, and relieving them of the consciousness of their previous morbid impression, while in fact it neither stimulates nor supports, but is a direct and positive sedative, debilitating both nervous and muscular structures, and diminishing the atomic changes throughout the organization. In calling your attention to the class of inebriates who have been ranked by some in modern times as laboring under a species of derangements called methomania, my object is simply to remind you that as physicians it is your duty to study these cases, and to bring the whole weight of your influence upon those who depend upon you as guides in reference to their health, to correct the errors under which so many in every community labor in regard to the real nature and effects of alcoholic beverages. I have thus, gentlemen, completed the consideration of the diseases which I had grouped under the head of nervous affections, and therefore come to the last division of our course, in which I propose to consider, briefly as possible, a number of morbid conditions arranged under the head of miscellaneous topics, which are of frequent occurrence in the ordinary routine of practice, often troublesome to manage and consequently of much importance both to the practitioner and to the patient.

LECTURE LXXXIV.

Miscellaneous or Unclassified Diseases—Their Variety, and General Remarks on their Causes and Tendencies.

GENTLEMEN: The practitioner of medicine is called upon for advice in relation to a considerable variety of ailments, usually of a chronic and more or less persistent character, which are not capable of being classed properly in either of the divisions or classes of disease that we have had under consideration during the present term. Most of the affections to which I allude have their origin either from hereditary predisposition, or from the habitual errors and evil influences that grow out of the habits of civilized society, and the various occupations pursued among men. That the faulty condition of the physical structure of parents may be transmitted more or less distinctly to their children there can be little doubt. And throughout all ranks of society in this and other civilized countries, there are to be found many individuals who have inherited such a degree of imperfection in one or more of the groups of organs which make up the animal economy, as to cause the frequent occurrence of imperfections in the performance of functions, and consequently sufferings that induce them to seek the aid of a physician. In one class of cases this defect may relate particularly to the organs of respiration, in another to that of digestion, in others to the development of the different portions of the nervous system, while in still others, the defects will relate more to the organs of generation. Such individuals will be regarded everywhere, by their medical advisers, as strongly predisposed to this or that manifestation of disease, sometimes without exciting causes, but more particularly, on the occurrence of even the slightest provoking cause. But inde-

pendently of hereditary influences, there are habits of life and practices prevalent in civilized society, which have a tendency to influence children from a very early period throughout their entire development to maturity or adult age. Those circumstances are sometimes connected with the process of education in schools, sometimes connected with their occupations when they commence some definite occupation early, and in other instances, simply growing out of the ordinary modes of dress and diet, and the degrees of confinement in-doors, or limit of exercise in the open air. It requires but a little practical experience and reflection to see that a large percentage of the children of both sexes, and especially of the female sex, who are born of parents themselves healthy, and in circumstances favorable pecuniarily and socially, that the predominance of attention is given throughout the whole period of their education to the cultivation of the intellectual faculties and acquisition of knowledge, to the great neglect of attention to the equal exercise of the muscular structures in different parts of the body, and consequently to the equal development of the physical system. This leads to the development in every community of a large number, who, during the whole period of adult life, suffer more or less from the predominant development of nervous excitability, with corresponding enfeeblement of the functions of digestion and excretion. Such parties may pass a large portion of life without any attack of a definite, well defined form of disease, such as typical forms of fever, or of a well marked local inflammation, and yet have such derangement of the functions of a minor character as to make them need medical advice almost every month in the year. Other classes by the nature of their occupation are induced to remain too much in-doors, sometimes occupying daily certain positions many hours in succession, and taking no habitual regular exercise out of doors from time to time, to counteract the evils of that which their labor induces, acquire certain inequalities in the performance of the functions of the body. Prominent among these is a lessening of the efficiency of the respiratory movements and consequent impairment of the changes which take place in the blood while passing through the pulmonary organs, constituting deficient oxygenation and decarbonization of the blood. This in turn lessens almost every secretion, because blood deficient in the supply of oxygen does not maintain the activity of the secretory cells, causing deficiency of secretion from the mucous membrane of the alimentary canal, including the gastric juice, with consequent derangements in the digestion of food and in the regularity of the alvine evacuations. The same defective condition of the blood renders it incapable of sustaining a healthy tone of the nervous and muscular structures, indicated by general lassitude and lack of power of endurance. Such patients, without any marked structural changes in any of the organs, will have as results from this impairment in the various functions, a constant tendency to accumulate enough of the products of tissue disintegration in the blood to induce once in from one to three weeks a sick headache, a paroxysm of indigestion or some other painful illness.

This kind of headache is termed sick headache or migraine, because soon after the commencement of the pain in the head, the morbid influence is radiated through the pneumogastric nerve to the stomach in such degree as to cause active vomiting. The patient, deprived of nourishment, placed at rest, and subjected to thorough and repeated vomiting, not only ejects the contents of the stomach, but relaxes the skin while under the influence of the nausea and increases the exhalations from that source. These changes are generally accompanied by the administration of some medicine that will operate upon the bowels. By such

increased eliminations, in the course of twenty-four or thirty-six hours, the retained effete materials that had been accumulating for one, two or three weeks, are thrown off. The derangements of the system being thus corrected, the headache disappears, and the patient, without pain or sickness, but feeling less than his usual strength, has a return of his appetite, and resumes his work. Being subjected again to the same causes, in about the same period of time, the former derangements are re-established, and culminate in another attack of headache and vomiting. And thus many patients go on with such a train of evils through years, and sometimes a large part of their lives. In other instances, a similar train of causes operating upon persons with less nervous excitability or cerebral sensitiveness, they will escape the headaches and vomitings from the imperfect performance of the functions of excretion, but will become more constipated, the gastric secretion less and less abundant, and consequently digestion being performed less perfectly, they come to assume the condition of confirmed dyspeptics, or to suffer for a time daily from imperfect digestion of food. There is usually no burning in the stomach, no general fever, pulse quiet, and temperature natural. They seldom emaciate, but on the contrary sometimes have a redundancy of fatty deposit in the tissues. They hardly take a fair meal, however, from one end of the year to the other without having it lay like a weight in the stomach for one or two hours after eating. And generally after the first hour has passed, there will commence generation of more or less gases, most of the time tasteless, but abundant in quantity. They will keep up eructations or belching of gases for an hour or more, after which all the symptoms pretty rapidly decline, and the patient is feeling comparatively comfortable until the next meal, when he goes through the same process. And thus from day to day he labors under the influence of gastric discomfort after each meal, rendering his mind despondent and gloomy, his nights often broken and uncomfortable by dreams of an unpleasant character, until he becomes habitually gloomy, and feels often that life is a burden. Most of these patients, in addition to the disturbances of the stomach just indicated, have habitually an inactive condition of the bowels, requiring frequently the use of laxative medicine to afford them relief. The urinary secretion is also high-colored, and when allowed to stand sometimes throwing down an excess of phosphates or ammoniacal salts, in the form of a white precipitate, which generally causes much anxiety on the part of the patient from fear of the supervention of serious disease of the kidneys. But this class of patients seldom have anything more than functional derangement of the urinary organs. Indeed, the continued activity of the kidneys in eliminating an increased quantity of the products of disintegration or natural tissue changes, constitutes the most reliable conservative process for keeping such patients from more dangerous functional derangements. The bowels being constipated, the skin dry, the kidneys are more persistent in executing their function than any other eliminating organs or structures in the system. Another class of patients whom you will meet with, on whom have been operative some of the same causes that I have already pointed out, when their derangements have arrived at that degree of development characterized by deficient gastric secretion and consequent indigestion, instead of going on to the development of disturbance of the brain and paroxysms of sick headache, or of habitual constipation and complete indigestion, stop at a point where the disorder of digestion is only moderate. This moderate gastric disturbance, however, is sufficient to establish a certain grade of morbid sensitiveness in the branches of the pneumogastric nerve through

which the morbid sensations induced by the contact of food in the stomach are reflected directly back along that nerve, sometimes only to the point where the cardiac branches leave the pneumogastric trunk, and produce disturbance in the heart's action. And consequently within a given time after each meal, the patient no sooner begins to feel slight indications of uneasiness in the epigastrium, or stomach proper, than his face becomes flushed, a sense of heat comes over him, and the heart begins to beat with a much greater degree of frequency and force than natural. After one or two hours he will be in great anxiety of mind from the excited or irregular action of the heart. For the cardiac disturbance may consist of simply increased frequency and force of beat, or it may be more or less irregular, beating rapidly and forcibly three or four beats and skipping one, or intermitting, or without the actual intermission, varying so rapidly from rapidity and force to that of slowness, as to create almost constantly the impression in the mind of the patient that there is serious disease of the heart, and he consequently becomes very despondent. Not infrequently the chief cardiac disturbance comes during the night, especially in parties who are in the habit of drinking too much strong tea. They no sooner get quiet in bed, or at most begin to catch short periods of sleep, than the heart will begin its unpleasant excitement and irregularity of movements, and they will feel obliged to sit upright in bed sometimes half the night, with the hands over the cardiac region, and the mind filled with anxiety from the impression that they are in danger from serious disease of that organ. As morning comes on, the stomach becomes emptied of its contents, the reflex irritability subsides, and the patient is quiet and comfortable. The most careful examination in the morning would detect no error in the circulation whatever, or in the movements and sounds of the heart. Closely allied to these cases are those in which the reflex disturbance extends from the stomach to the recurrent branches of the pneumogastric nerve, causing contraction or a sense of choking in the neck. This symptom is frequently associated with the irregular and excited cardiac movements just described, causing the patient, for the time being, the most distressing feelings of impending death from suffocation or complete suspension of the action of the heart. I allude to these modes by which distressing symptoms of various kinds are developed, of a character difficult to classify, and yet of so frequent occurrence as to constitute an important part of every physician's practice who may reside in a populous community, as represented by cities or large villages. Yet, as in other ailments, the patient will be, in many instances, anxious for the doctor to give him the name of his disease. He wants this not only for his own satisfaction, but that he may tell all his neighbors also. This anxiety to have a name given to their disease has induced many members of the profession to use certain vague terms that satisfy the popular mind without conveying any definite knowledge. In former times, nearly all of these ailments were classified under the head of biliousness. Simply, because when the doctor was pressed to know what the matter was, he found it more convenient to give them a name that they would think they knew something about, than to try to explain the complex derangements of function which really constituted their difficulties, and which if he explained ever so minutely not one in a hundred of the patients would be capable of understanding his explanation. Hence, the common practice of telling such persons that they are bilious had led to the almost universal adoption of this term for covering most of the nameless or unclassified ailments in the community. In recent times, however, biliousness has found a popular competitor in the

expressions nervous prostration, nervous exhaustion or neurasthenia. These latter names are especially applied to such cases as involve headaches, sleeplessness, palpitations, and all the other troubles in which the nervous phenomena are most prominent. I would not do justice in these general observations, however, if I failed to mention another class of cases consisting almost entirely of members of the female sex, who, through errors consisting chiefly in the modes of dress, such as leaving the feet and ankles imperfectly protected during the cold seasons of the year while a large proportion of the weight of all their clothing is hung upon the body by close attachments directly around the waist, and that part of the trunk on a horizontal line with the epigastrium. By such methods the epigastric and hypochondriac regions are compressed, thereby crowding the abdominal viscera downward, and on the one hand favoring depression of the pelvic organs and on the other limiting materially the freedom of the expansion of the lower part of the chest. This lessens by a few cubic inches the volume of air habitually taken at each inspiration, and correspondingly lessens the efficiency of the oxygenation and decarbonization of the blood. A large class of females coming to maturity under such modes of dress suffer almost continuously from some degree of impairment of the digestive functions, habitual torpor or inactivity of the bowels, a ready nervous excitability, giving rise frequently to headaches, sometimes to palpitations, especially if they indulge early in the use of tea and coffee; imperfect rest at night, but more prominently than all, pains in the back and loins whenever much upon their feet, either in standing or walking. Many of this class also suffer pains in the inguinal regions or in the direction of the uterine ligaments whenever any considerable exercise is taken, and during the early part of adult life are almost certain to have severe suffering during every period of menstruation, more particularly a day or two preceding the commencement of the flow, or during the first day of the flow itself. In some instances these pains are moderate, in others excruciatingly severe; so much so, that each period leaves them more or less debilitated and depressed, requiring half of the interval before the next period to recover from its effects. Many who do not thus suffer pains at this time, either have the flow too often, as every three weeks instead of four; and if not too often, so freely as to occasion an excessive loss of blood. Whether the flow is excessive or not, a leucorrhœal discharge is apt to follow for a week or ten days after the true menstrual flow has ceased. In nearly all such cases, the leucorrhœal discharge is thin, white and of a serous character. Occasionally it will be more purulent, and sometimes more decidedly of a mucous character. This latter class always or almost always present a pale, anæmic aspect and are very easily tired. They complain of weariness on the slightest exertion and are incapable of enduring more than a very moderate amount of fatigue.

If you would discharge your whole duty as a medical adviser of such patients, in the attempt to remove their difficulties, and render their lives more happy and of longer duration, instead of limiting your efforts to the mere function of temporarily warding off whatever evils may be present at the time, you will in addition faithfully and honestly endeavor to remove the causes which have led to their suffering. There is no department in the whole field of practice which affords the physician who would acquire a reputation in the beginning of his professional career, that is so important if well cultivated, as that occupied by the great class of chronic invalids. For it is the large class of patients who are suffering from these unclassified ailments, consisting in impairments of one or more important

functions, rendering them supplicants who go from one physician to another, and then from the physician to the mountebank or medical pretender, and from him to the newspapers, and the drug manufacturers for their advertised nostrums, for the simple reason that the physicians they had consulted failed to take that interest in the cases which is necessary to trace out their origin, and to faithfully, honestly, and yet kindly, inform them of the sources of their evils and impress upon them the necessity of correcting and obviating the causes, as an absolute prerequisite to any permanent improvement. Having made these general observations sufficiently simple to indicate to you, in general terms, the sources to which you are to look in tracing out the causes which may have been operative in producing the affections you may be called upon to treat, belonging to the class now under consideration, I will proceed to the consideration of the more important of these derangements in detail; taking first, those in which the more prominent symptoms are connected with the respiratory organs; next with the circulatory; third the digestive, and lastly the organs of excretion. The principal derangements of which I shall speak, connected more prominently with the respiratory organs, are spasmodic asthma, laryngismus stridulus or spasmodic croup, aphonia and exophthalmic goitre. Those in which the prominent symptoms are manifest through the circulatory system will be grouped under the heads of angina pectoris, cardiac irritability and palpitations, fatty degenerations in the heart and vessels, aneurisms, and emboli. Those affecting the digestive organs I shall group under the heads of indigestion or dyspepsia, gastralgia, constipation and intestinal parasites. Those affecting the excretory organs more particularly, will include diabetes mellitus and insipidus, eneuresis, lithiasis, urinary and biliary calculi, and defective eliminations from the skin. In connection with the excretory organs, I shall also allude to those rare developments of cysts, embracing echinococci in the liver and kidneys; also a brief consideration of the special toxæmic conditions of the blood usually included under the terms septicæmia and pyæmia.

LECTURE LXXXV.

Spasmodic Asthma and Laryngismus Stridulus—Their Causes, Symptoms, Diagnosis, Prognosis and Treatment.

GENTLEMEN: In the ordinary field of general practice cases are not infrequently met with of a purely spasmodic or functional character, affecting the respiratory passages, more particularly the larynx and the smaller bronchial tubes. They do not constitute distinct diseases in the proper sense of the word, but rather symptoms of some preceding pathological condition, on which the existence of the paroxysms of contraction in the larynx and bronchial tubes depend. They are manifest almost invariably in paroxysms of temporary duration. When affecting the bronchial tubes and giving rise to much dyspnœa, or asthmatic breathing, they are more frequently met with in adult life. A similar condition affecting the larynx is much more frequent in children, although it may occur during any period of life. During the paroxysms the chief symptoms, when affecting the bronchial tubes and taking the ordinary name of asthma or

spasmodic asthma, consist of very decided constriction or difficulty of breathing, causing a sense of suffocation, and great oppression or tightness in the chest, accompanied by more or less wheezing or dry hissing, sibilant and sonorous rales, which are heard throughout the whole chest, both anteriorly and posteriorly. At the same time that the patient experiences these difficulties, the oppression and laboring for breath, accompanied by wheezing, dry rales, the face becomes more or less suffused with redness, sometimes more of a leaden or purplish hue; the patient assumes the upright position, leaning a little forward, endeavoring to rest the elbows upon the knees, so as to form a point of support to aid the extraordinary motions of the chest. The expiratory acts are almost as difficult as the inspiratory, and nearly of the same length. If the paroxysm continues more than a few minutes the patient feels an extreme sense of weariness, the skin becomes relaxed and bathed with perspiration; the pulse soft, weak, and a little accelerated in frequency; a sense of oppression, almost of drowsiness, comes over the patient, and yet he has entire inability to sleep, causing an extreme sense of weariness and exhaustion. These paroxysms continue a variable period of time, from not more than fifteen or twenty minutes to six or eight hours. They much more frequently manifest themselves during the night, usually after the patient has fallen asleep. He is started up from his sleep by a sense of suffocation and oppression, and usually throws the windows and doors open for fresh air, and generally insists on keeping the upright position or inclining forward as I have already mentioned. Commencing in this way, usually in the early part of the night, after the first half hour or hour of sleep, it will usually continue till near morning; in most cases, from three to four o'clock in the morning, the difficulty of breathing will gradually diminish, air will enter more freely to the air cells, and the patient will soon obtain a sense of relief from the suffocation, and in half an hour more reclines at an angle of forty-five degrees, having the head still moderately high, and falls asleep. The patient usually perspires freely, and often sleeps four or five hours, if left undisturbed, and wakes up feeling weary, but with entire freedom of breathing; the rales are gone from the chest, the pulse is natural in frequency, and nearly so in force, and no symptom or physical sign remains to explain the apparent obstruction and great dyspnœa that had characterized the paroxysm. These latter may recur every night, or they may occur only at entirely irregular intervals, depending upon certain other derangements which precede them. They do not, like bronchitis, or the dyspnœa from inflammatory affections of the respiratory organs, occur more frequently in cold seasons of the year. But this spasmodic variety of disease may recur at any and all seasons of the year. It is regarded as of more frequent occurrence in males than in females. As I have already remarked, it is a symptomatic affection, and may be caused by derangements either connected with the digestive organs, which is perhaps more common than any other, or from some peculiar susceptibility, or genuine idiosyncrasy of the nerves connected with the air passages. The most common cases of all, are those which are directly dependent on primary derangements of the function of the stomach. Digestion being imperfect, the patient retiring to bed with more or less undigested food, and deficient gastric secretion, the stomach soon becomes more or less distended with gases, and their action with other morbid products in the stomach produces an impression upon the gastric branches of the pneumogastric nerve, which is reflected through the connections of that nerve upon those supplying the delicate muscular fibers entering into the coats of the bronchioles and smaller bronchial tubes, inducing a

genuine spasmodic contraction of these fibers, and a narrowing of the tubes, which is the immediate cause of the paroxysms of dyspnœa. After the derangement of the stomach is relieved by the discharge of the gases and other materials so as to remove the exciting cause, the asthmatic paroxysms speedily subside. But if no measures are taken for preventing a renewal of the gastric disorder, the dyspnœa will also recur in paroxysms more or less frequent. Almost any marked derangement in the digestive organs is capable of inducing reflex irritation that will bring temporary paroxysms of dyspnœa or asthmatic breathing. There are some persons, however, who possess a peculiar idiosyncrasy in the sensibility of the nerves connected with the respiratory organs, by which they are made liable to an attack of spasmodic asthma whenever certain substances diffused in the atmosphere are allowed to enter the air passages by inhalation. Certain powders, with these persons, will immediately develop a temporary paroxysm of this disease. Powdered ipecac and the odor or pollen of certain flowers and plants, have been known invariably to induce paroxysms of the disease in persons thus predisposed. It is undoubtedly true, that aside from actual idiosyncrasy in this respect, there are some cases in which ordinary causes have produced that degree of morbid sensitiveness in the bronchial nerves that renders the patient liable to be thrown into paroxysms of spasmodic dyspnœa on the slightest provocation. A slight morbid sensibility in any portion of the anterior lobes of the brain extending back far enough to involve the origin of the pneumogastric nerves may render the individual very sensitive to moderate impressions, or what is popularly styled exceedingly nervous or easily excited. A few instances of that class I have known to be subject to paroxysms of great difficulty of breathing, almost uniformly from any sudden emotion, or strong mental impression. Almost any variety of sudden and decided mental excitement would be sufficient to bring on paroxysms of difficulty of breathing, resembling in all respects spasmodic asthma, and usually lasting from five minutes to an hour. I have particularly in my mind at the present time a woman, aged about twenty-three years, who for the last three years has been affected with this form of difficulty, coupled with a simultaneous spasmodic affection of the larynx. And so sensitive has she become that great care is required to avoid the moderate mental disturbances which may occur in almost any intercourse in society, lest a paroxysm should be induced. And they become so frequent as to render the patient's life exceedingly troublesome, and the mind habitually despondent. Yet the closest scrutiny could not detect any organic or structural changes, nor inflammatory affections either in the larynx, or any part of the bronchial ramifications. When a similar paroxysmal constriction takes place in the larynx as I have described as occurring in the bronchial tubes, which often happens in children, it constitutes *laryngismus stridulus* or *spasmodic croup*. And it may arise from any and all the causes I have alluded to, as producing the asthmatic difficulties. There being a predisposition consisting of undue sensitiveness of the nerves of the larynx, any slight irritating influence, whether the inhalation of impure air, irritating vapors, or being exposed to chilly night air will be sufficient to provoke an attack. Perhaps the most frequent causes are the sudden impression of cold and damp air, or even allowing the feet to get unusually cold, and temporary derangements of the digestive organs, especially the formation of gases in the stomach at night. An attack is most liable to supervene after the first hour or two of sleep, when the patient awakes suddenly with a sense of suffocation, and such a contraction of the muscular structures connected with the

larynx and vocal cords, as to produce great difficulty of inspiration and inclination to cough, with loud, ringing, stridulous sounds, as though the patient had suddenly developed the most dangerous form of croup or laryngitis. The paroxysm thus developed will usually last from one to three or four hours, when it subsides, leaving the patient almost entirely free from any conscious difficulty, either in the breathing, or in the tendency to cough. This, like the asthma, may be renewed each night for several nights in succession, or it may come only in individual paroxysms at irregular and sometimes long intervals. Both this affection, so common among children, and the spasmodic asthma, are distinguished from the difficulty of breathing which we have already described in connection with inflammation of the larynx and bronchial tubes, by the fact that the active symptoms are all purely paroxysmal, in the interval there remaining no physical signs even of congestion of the mucous membrane in those passages. This of course is not the case in either laryngitis or bronchitis; while there will be paroxysms of difficulty of breathing in the latter instances, in the intermission between the paroxysms the patient still has some degree of difficulty and the physical signs of congestion still remain as constant phenomena till the disease is removed. Another marked distinction, is, that in the inflammatory affections of the larnyx and bronchial tubes the temperature of the patient is increased, constituting more or less febrile movement, the pulse is accelerated, while in the spasmodic affection there is no increase of temperature, more frequently rather a diminution, and the pulse has none of the short, quick, febrile quality, that belongs to the inflammatory affections I have named. As these spasmodic affections seldom if ever prove fatal, there are no anatomical changes known to be characteristic of their existence.

Treatment.—As you will have inferred already, from the fact that the spasmodic affections I have described are symptomatic, always arising from some prior pathological condition found in other organs, the respiratory trouble being only from reflex influence, the great and leading objects of treatment are: first, to hasten the relief of the patient from the existing paroxysm, when called during its existence, while the second, and more important object is to ascertain the pathological conditions from which the troublesome paroxysms originate, and adopt such measures as may be indicated for their removal. For accomplishing the first object, it is sufficient to bring the patient quickly under the influence of almost any reliable antispasmodic and slightly anodyne remedy. The cautious inhalation of an anæsthetic, like chloroform or ether, still better the nitrite of amyl or the vapor of the oil of eucalyptus, will in many cases speedily relieve the existing paroxysm. So will the internal administration of a combination of almost any mild anodyne with an expectorant. A combination of the camphorated tincture of opium with the compound syrup of squills, to which may be added a certain proportion of the tincture of lobelia inflata, constitutes, perhaps, one of the most efficient that can be made for the relief, both of the laryngeal spasm and the asthmatic paroxysms. A prescription, consisting of the compound syrup of squills thirty c. c. (℥i), tincture of lobelia fifteen c. c. (℥ss) camphorated tincture of opium forty-five c. c. (℥iss), may be made, of which four cubic centimeters, or one fluid drachm, diluted with a tablespoonful of water may be given to an adult at once. It may be repeated in one or two hours, if relief is not sooner obtained. The same combination, only reducing the dose so as to adjust it to the age of the patient, may be given to children, particularly for the relief of what is commonly known as spasmodic croup. Where the lobelia might be objectionable on account of its tendency to

excite too much nausea or sedative action, an equal quantity of the tincture of sanguinaria may be substituted in its place. In some instances I have seen very speedy relief result from giving proper doses of an equal mixture of the fluid extract of grindelia robusta, and camphorated tincture of opium. Many families having children who are somewhat predisposed and consequently are frequently attacked with this variety of croup or spasmodic laryngeal affection, keep constantly on hand the ordinary syrup of ipecac, and whenever the children are attacked, sufficient is given to produce nausea or slight vomiting, which causes relaxation of the parts involved, and the paroxysm passes off. But the more important part of the treatment in all such cases is to ascertain as accurately as possible the derangements which precede and give rise to the phenomena that we have been discussing, that such measures may be adopted as will remove them and thereby prevent the recurrence of future paroxysms. Those cases which depend upon some natural idiosyncrasy rendering the patient liable to attacks either of laryngeal or bronchial spasm, from inhalation of certain substances in the atmosphere, are probably incurable. They are, like other idiosyncrasies, congenital and usually continue through the whole period of life. Yet in some instances they have been known to gradually diminish after the middle period of life, and finally disappear. When there is morbid sensitiveness of the nerves of the air passages, accompanied by a general nervous temperament, constituting a condition that is easily impressible from almost any cause, the object of the physician should be to give such instructions to the patient or his parents and guardians as will enable them to adopt a system of training calculated intelligently to change this morbidly sensitive constitutional condition to one more healthy, and thereby do away with the unpleasant consequences that would otherwise annoy the patient through life. Among the measures most important for such patients is the wearing of flannel next to the surface during all the cold, damp and variable seasons, which in the northern part of this country would embrace nearly all the year, living upon plain, easily digestible food, and a regular daily practice of moderate out-door exercise, including positive exercise of the chest and arms, thereby cultivating strength and efficiency in the muscles concerned in carrying on the involuntary process of respiration. In some cases during the last two or three years, I have obtained considerable advantage by causing the patient to inhale, for three to five minutes at a time, the vapor of the oil of eucalyptus morning and evening. This vapor appears to exert a sedative effect upon morbid nervous sensibility, and to excite healthy secretory action in the mucous follicles of the membrane lining the air passages. In that large class of cases of spasmodic bronchial affection existing in connection with, and sometimes dependent upon, derangements of digestion, the only rules that can be laid down for their management is to adopt such measures in regard to diet, exercise and medicine as are required for the effectual correction of the digestive derangements, including regulation of the bowels and the promotion of the natural secretions, especially from the skin and kidneys. For observations show that a large proportion of the cases where, from gastric derangements, the air tubes are frequently constricted, interfering more or less with the uniformity of the functions of the lungs, the urine is very liable to become impregnated with a large excess of the phosphatic and ammoniacal salts. In such cases, the urine on cooling deposits a large amount of a white or pinkish white color, which is wholly dissipated by heat or nitric acid. All these derangements affecting digestion and the important eliminations from the kidneys and skin, require the attention of

the practitioner if he would succeed in permanently restoring the patients to reliable health. Among other things it often becomes necessary to correct the patient's mode of doing business, or the kind of work in which he is engaged. For many of this class will be found either so occupied as to be kept an inordinate amount of time in-doors, very frequently in confined air, or sleeping in close, poorly ventilated and warm rooms at night. Sometimes they are engaged in occupations where the air is impregnated continuously with some foreign substance, as in the manufacture of tobacco, and various other manufacturing processes that cause habitual impregnation of the air which the workmen are obliged to inhale. Another difficulty occasionally met with in direct connection with the respiratory passages, more particularly with the larynx, is that of *aphonia* or loss of voice.

Aphonia.—When speaking of laryngitis in all its various grades, you will remember that we had alterations of the voice in every degree, from that of the loud, harsh and ringing, to entire suppression or reduction of the voice to a whisper, accompanying most of the inflammatory conditions of that part of the respiratory apparatus. But, aside from this, there are conditions of the nervous system which are accompanied by entire aphonia or loss of voice. This is not of very frequent occurrence, and is chiefly met with in females of a highly nervous or hysterical temperament. In this class of patients, many cases have been observed in which from sudden mental impressions or the paroxysms of high nervous excitement, the voice has been suddenly lost, the patient being entirely unable to articulate a sound or to make any audible sound above that of a whisper. Such cases are distinguished from inflammatory affections by the entire absence of soreness, pain or any of the phenomena of inflammatory action, and when examined for the physical signs by the laryngoscope, or even by listening over the larynx with the ordinary stethoscope, there is absence of all the signs that accompany inflammatory congestion or exudation in the membrane lining the larynx, or covering the vocal cords. In most such instances, a careful inspection of the parts with the laryngoscope shows either partial or complete paralysis of the functions of the vocal cords. In some instances, the loss of voice is felt for a few minutes, and in others it lasts for days or weeks. Perhaps the most efficient agent, which is calculated to act quickly in restoration of the loss of voice from paralysis or from suspension of the natural action of the parts, is that of electricity applied by faradisation, or any other method by which electric or electro-magnetic currents of a moderate degree of intensity are made to pass through the parts involved. The application may be continued from five to ten minutes at a time, and sometimes results in at once re-establishing natural action. At other times it requires an application each day for several days. If the patients are troubled at the same time with other nervous phenomena, the use of such nervous sedatives, antispasmodics and tonics as may be indicated to improve the general condition of the patient will also assist in restoring the action of the vocal cords. If such patients are debilitated, requiring the influence of tonics, perhaps one of the best that can be given for preventing a recurrence of the aphonia after the voice has been once restored, or even during the process of the restoration, is the combination of moderate doses of strychnia, quinine and iron. They are agents that may be very conveniently combined in proper proportion in doses to suit the age of the patient, in gelatine capsules, and administered without annoyance to the patient. Although not usually mentioned by writers upon practical medicine, there is a class of patients which you are liable to come in contact with who are, as you

will find, very much alarmed at times with a sense of difficulty of breathing, or rather a sense of want of breath and weakness across the chest. Usually, in the paroxysms they present a pale and anxious expression of countenance, almost always sitting upright in the bed or chair, and when you approach them complaining with great alarm that they are suffocating or cannot breathe; and yet, aside from the expression of countenance I have mentioned, you find on further examination that the pulse and temperature are natural and no rales in the chest. But in watching them for a moment or two you will observe that the inspiratory and expiratory movements are performed imperfectly or inefficiently, perhaps for five or six respirations, and ending in a deep, sighing inspiration by which the patient apparently seeks instinctively to compensate himself for the defectiveness of the respirations that occurred between these sighings. The mechanism of the breathing in these cases is not that of asthma or of any constriction of the air passages. It is rather impairment of the function of the nerves connected with respiration, and a condition of the bronchial tubes similar to that which involves the vocal cords and larynx in aphonia. It is a direct, though temporary, impairment of the function of respiration, the respiratory movements being so defective that the patient feels a sense of impending suffocation, or as though the mechanisms of respiration and circulation were about to stop. I have met with such cases more frequently in females who are in the habit of using freely and habitually strong tea than in any other class of subjects; but it has not been restricted altogether to them. I have met with the same phenomena in adults of the male sex, and in some instances of females who are not addicted to the use of any inordinate amount of tea or coffee. But perhaps a large proportion of all I have seen have been subject to the excessive use of those agents, and more especially of the tea. Among the more common cases of the kind are women who are nursing. Within the first two or three months after their confinement, following the popular notion that while nursing they must take an extra amount of drink, and that tea helps to form milk, they acquire the habit of taking sometimes from six to twelve ordinary cups of strong tea in the twenty-four hours. Occasionally one takes less, but substitutes in place of it beer, ale or porter. These patients almost invariably lose their appetite for food and consequently eat but little, depending altogether upon their drink; the result of which is that the theine of the tea being a direct nervous excitant, increases the inherent susceptibility of the nerve structures and in process of time develops an extraordinary impressibility or excitability of the nerves that are more particularly connected with the heart and respiratory organs. The use of the beer and ale modifies the effect but little, while it aids in destroying the appetite for wholesome food, and the patient becomes more or less impoverished in the nutritive elements of the blood and subject almost every night and sometimes during the day to those distressing feelings of oppression and inability to breathe, occasionally accompanied by irregular action of the heart. I have many times been called in the night to patients of this class, under the positive assurance that they were in danger of dying, and when I arrived, found them sitting in bed, as I have described, pale, anxious, skin bathed in perspiration, but cool, and not a shadow of physical evidence of obstruction in any part of the air passages, and the heart perfectly free from evidence of any structural or valvular change; the whole difficulty being dependent upon the impairment of nerve function in carrying on the mechanical process of breathing. For immediate relief to such patients, I have found no remedy more efficient than a combination of

digitalis, scutellaria and valerian in such proportions that with each dose of four cubic centimeters (fl. 3i) the patient would get two cubic centimeters (fl. 3ss) of the fluid extract of valerian, one cubic centimeter (min. xv) of the tincture of digitalis, and the same quantity of the fluid extract of scutellaria. This dose may be given disguised in a little sweetened water, and repeated every two hours until the patient is relieved from immediate distress. And the same given morning, noon and night for a week or two after the immediate paroxysm has passed away will contribute much to prevent its recurrence. But the great reliance for the cure of such derangements is in the removal of the causes that have led to them, viz., the discontinuance of all excess in the use of tea and coffee, restricting the use of these agents to one cup of moderate strength at a meal-time, requiring patients, if they really need more drink, to take milk or water, and the entire disuse of all fermented or distilled drinks. At the same time require them to moderately exercise in the open air every day, either by riding or short walks, as their strength will allow, and to take plain, easily digestible food at the regular meal-times. Obedience to these requirements will serve to restore almost every one of them in a few weeks to a fair appetite, ability to sleep well, or in other words, a reasonable degree of health. Yet, I have seen many of these cases that had not been well understood, and in consequence had suffered for a longer period of time, and some cases of nursing women who actually took the child from the breast at an unreasonably early period, under the impression that there was no chance of recovery without doing so. Next to the nursing women, the parties most frequently affected with this kind of functional difficulty are servant girls who are employed in-doors, and especially in the kitchen. Taking but little outside air and contracting the habit of using an inordinate amount of tea, large numbers of them suffer more or less from the kind of derangement that I have indicated, coupled with a tendency almost constantly, to constipation of the bowels, impairment of appetite, impairment of digestion, till some of them become disabled from the prosecution of their work. And yet it only requires diligence in ascertaining their habits to arrive at a proper appreciation of the causes and remove them, when health may soon be restored.

LECTURE LXXXVI.

Functional Derangements of the Central Organs of Circulation—Cardiac Irritability.

GENTLEMEN: Closely allied to the class of cases to which I was directing your attention at the close of the preceding lecture is another, embracing a less number of patients, but still not very rare. I allude to what I shall denominate simple cardiac irritability from nervous derangement or perversion of nervous function. The cases to which I now allude will be best understood by a brief enumeration of the more prominent symptoms. They are met with much more frequently from the period of puberty to twenty-five or thirty years of age. It is only seldom that I have met with cases beyond the latter period of life. In most instances the patients have been spare in flesh, slightly anæmic in their appearance, presenting what would be denominated a nervous

temperament, and very generally sedentary in their habits, or following some occupation that keeps them most of the time in-doors. The prominent symptom which causes this class of patients to seek the advice of the physician, is rapid beating of the heart. When fully characterized, it is not ordinary palpitation of the heart, such as comes frequently a few moments at a time and subsides, but it is a continuous rapid beating. In some of these cases I have found it difficult to count the beats of the heart from its rapidity. The systolic action was short, quick and repeated so rapidly, that no distinction between the first and second sounds could be recognized. Of course the pulse has the same degree of rapidity, and is almost always soft, easily compressed or weak. The respirations are habitually accelerated, but not in comparison to the degree of acceleration of the pulse. There is often a continual feeling of oppression, especially behind the lower part of the sternum, which prompts the patient every now and then to take a deep inspiration or sigh. There is no febrile movement, no physical sign of pericarditis or endocarditis. Some of these cases where the cardiac irritability or extreme rapidity of action has continued from one to three weeks, rendering it difficult for the patient to sleep at night, it has resulted in much general debility, as well as a constant feeling of anxiety and oppression. A majority of this class of cases, however, do not have the periods of cardiac excitement continue so long, but they will recur in paroxysms. From slight undue mental excitement and slight exertion it will return upon them with full development of its rapidity and continue perhaps one or two hours, then gradually subside, leaving them again comparatively free till some slight cause produces its return. They may be subject to these paroxysms two or three times in the twenty-four hours, but in some instances it comes the same time once every day, for several days and nights in succession. Close examination of such of these patients as have come under my own care has revealed the fact that they have either suffered themselves to be kept too continuously in-doors, with almost constant mental application, or that they have been subject to some special disturbing influence of a depressing character operating upon the nervous system through the mental emotions and affections. Sometimes grief from loss of friends has produced it. In some instances it has resulted from severe disappointment or the sudden breaking off of attachments, and in a very few instances I have found it in connection with cases of long-continued and excessive self-abuse. All these cases of course are to be distinguished or differentiated, both from structural disease of the heart and inflammatory affections of that organ by careful attention to the physical signs. In some instances, where the heart at the time of the physician's visit is beating with the rapidity I have described, he may be uncertain as to whether there is organic change in the valvular structure of the heart, from the mere fact that he can not analyze the rhythm. In all such instances he may properly leave a completion of his diagnosis until he has subjected the patient to some suitable remedy for steadying the heart's action, till the paroxysm has passed away, and he has opportunity to examine the patient again when the cardiac systoles are nearer their natural frequency. This will enable him, without any doubt whatever, to perceive that there are no murmurs or other signs indicating structural change.

Treatment.—The treatment of this class of cases, like the other symptomatic disturbances to which I have been calling your attention, embraces two objects; the one to relieve more directly the excessive cardiac action, and the other to remove the cause. In almost all cases that have come

under my care I have succeeded in accomplishing the first object by the use of the same combination of the fluid extracts of valerian, scutellaria and digitalis that I gave you in the preceding lecture. By giving it in moderate but frequently repeated doses, the digitalis soon controls the cardiac excitement, while the other ingredients lessen the general nervousness and sustain the strength of the patient. Whenever this effect is induced, to prevent exaggerated action of the digitalis the intervals between the doses must be greatly lengthened, aiming only to perpetuate sufficient influence to steady and strengthen the heart's movements without unduly diminishing their frequency, and without producing constriction of the chest. There are many other remedies which will afford relief temporarily. Fluid extracts of cactus grandiflora and convallaria, either alone or in combination with other mild tonics and antispasmodics will generally produce the desired effect. When, through the direct interference of medicine, the patient is relieved in a great measure from the immediate embarrassment of the circulation, the next important object should be the removal of the causes which may have led to it. And as this almost invariably involves either the occupation or the habits of the patient, it is necessary that these be pointed out and that the patient be fully and explicitly warned of the necessity of changing them if he would make any permanent recovery. Mental application must be limited within a reasonable length of time each day, and thereby allow a reasonable time for out-door exercise, and especially exercise of the chest by fullness of respiration and free movements of the arms. All those habits which would impair the general tone of the nervous system must be omitted. The sleeping room must be well aired or ventilated, and of sufficient capacity to supply the patient with fresh air during the whole of the night. Complete avoidance of such nervous excitants as tea and coffee, such anæsthetics as alcoholic liquors and tobacco, must be practiced. The patient should be left on pure air, moderate out-door exercise, a reasonable limit to mental applications, and there will usually be no difficulty in bringing about a permanent change, with sufficient physical vigor and health to secure relief from all danger of future attacks.

ANGINA PECTORIS.

The next subject to which I will direct your attention is usually denominated *angina pectoris* and sometimes neuralgia of the heart. It generally occurs in persons past the middle period of life, and perhaps more frequently in men than in women. It is also noticed very frequently among those who are leading sedentary lives, following occupations that keep them much in-doors, and a large proportion of them are addicted to the habitual use of strong tea and coffee. The symptoms of this affection usually supervene suddenly, though sometimes a dull, aching, depressing pain is felt in the cardiac region, gradually increasing through several hours before the paroxysms become fully developed. In most instances the patient begins to realize a pain of the character I have just mentioned together with a feeling of weight or hard pressure as of a heavy body upon the left side of the chest, and in from a few minutes to an hour or two, increasing in severity until the patient appears extremely distressed. The pain centers in the cardiac region and radiates upward to the shoulder and sometimes down the left arm and not infrequently directly backward between the left scapula and the spine. The intensity of the suffering is accompanied by a sense of great oppression, causing an anxious expression of countenance, face generally pale, surface of the body cool, and not infrequently bathed in perspiration, extremities cold, pulse soft, weak and

sometimes quick, but more generally not faster than natural and occasionally intermitting. The respirations are very variable on account of the intensity of the distress and sense of oppression in the chest, and the patient every few minutes takes a deep sighing inspiration or attempts to do so, which is sometimes defeated by the severity of the pain which arrests the expansion of the chest before its completion. The location of the pain centering in the cardiac region and sometimes radiating in the directions already named, the entire absence of febrile phenomena, the suddenness with which the attack supervenes, with the extreme anxiety depicted in the face, soft, irregular pulse, cold surface and extremities, are sufficient to characterize this form of disease and distinguish it from the painful affections of the stomach called gastrodynia and sometimes gastralgia on the one hand, and from pleurodynia or pain in the intercostal spaces on the other. The paroxysms, as I have described them, continue very variable periods of time in different cases and in different attacks on the same patient. In the majority of instances the suffering begins to abate in about one hour, and frequently diminishes so rapidly that the patient is comfortable, though feeling extremely weak, at the end of another hour. There are some cases where it will be shorter, lasting not more than ten to fifteen minutes. There have been others in which it has continued with much severity for twelve, or even eighteen hours; and there are instances on record, although they are few in number, in which a severe and protracted paroxysm has terminated in the death of the patient. Patients who are subject to attacks of this disease suffer from them at very variable periods of time. In some cases they recur with some degree of severity almost every day or more than once in the day. But in the great majority of cases they recur only at intervals of from one to three or four weeks, unless in such cases as are liable to their recurrence at any time from particular motions or exercise. In some cases paroxysms are brought on at any time by attempts at active walking, going up stairs or any active muscular action.

Pathology.—There can be little doubt but that the seat of this affection is in the heart itself, or in the cardiac nerves; yet there are no uniform structural changes that can be detected by post mortem examinations that appear to be specially characteristic of this form of disease or to be the special cause of the paroxysms of severe suffering. In some instances the coronary arteries have been found ossified, in others there have been indications of gouty deposits and concretions in the coats of the arteries, instead of ordinary ossification. These have been patients who are either hereditarily or otherwise disposed to attacks of gout, and are suffering from the gouty diathesis. In perhaps a larger number of cases the only change that has been found after death is more or less fatty degeneration of the muscular structure of the heart, causing diminution of its muscular force, and consequently impairment of its ability to circulate the blood. One writer has claimed that the disease consists in a spasm, or more or less tonic contraction of the coronary arterioles. That some influence of the kind may be exerted over the arterioles through a morbid condition of the vaso-motor nerves supplying them, is very probable during the paroxysms of this affection; but there is no proof that such is uniformly the case. There have been a large number of examinations, some of them very minute and reliable, of patients who have been subject to severe paroxysms of angina pectoris for years, and yet no structural lesions have been observed after death. And in those cases where the changes I have enumerated have been found after death, the history of each individual patient renders it evident that the changes,

such as ossification of the coronary arteries, gouty deposits and fatty degeneration are rather coincidents, resulting from causes altogether independent of the angina pectoris, and that they are simply coincident pathological conditions, instead of causes of that disease. From such cases as have come under my own observation, I am led to think that the immediate paroxysms of angina pectoris are caused by a morbid condition of the nerves supplying the vessels of the heart, and leading primarily to contraction of those vessels, lessening the supply of blood to the muscular structure, and inducing both pain and impairment of the force of the heart's action, and consequently developing the extreme anxiety, pain and depression that the patient endures. That ossification of the arteries, gouty changes, fatty and atheromatous deposits or any similar structural changes, by interfering with the natural action of the muscular structure as well as with the sensibility of the nerves, may predispose to the occurrence of angina pectoris, there can be no doubt; but their relations to the disease are those of predisposing influences rather than pathological changes constituting a necessary part of the disease.

Causes.—I have been led by clinical observation to the conclusion that the liberal use of tea, coffee, tobacco, and perhaps in a less degree alcoholic drinks, has a tendency more or less to favor the occurrence of angina pectoris in persons beyond the middle period of life, and especially as they approach what is called old age, or the period between fifty and sixty years; also sedentary habits, confinement in-doors, particularly if at the same time they are pursuing persistent and laborious mental occupation. It is probable that all these causes operate, not in directly inducing the painful affection called angina pectoris, but by interfering with the functions of respiration and digestion, and ultimately impairing the nutritive processes more or less, they lead to those structural changes I have already enumerated, especially such as fatty degenerations, impairment of the muscular force of the heart and perversion of nerve sensibility. These cause the patients to experience that weakness of cardiac action which renders them liable to attacks of pain on the supervention of any exciting cause, as undue exertion or imperfect digestion. And in many cases, after they have suffered a few attacks, they become liable to have them supervene, even without any special exciting cause.

Prognosis.—The prognosis in any given case of angina pectoris must depend almost entirely upon the question whether any portion of the cardiac structures have undergone anatomical changes of a fixed or permanent character. If the cavities of the heart are enlarged by dilatation, if the arteries have become more or less ossified, if gouty, fatty or atheromatous changes have taken place in the muscular structure of the heart, as these are changes not usually capable of being removed, there is every reasonable probability that the paroxysms of angina will continue to recur on the occurrence of the slightest exciting cause during the remainder of the patient's life. But if on close examination, aided by careful physical exploration of the chest, no structural changes can be detected and the systolic action of the heart between the paroxysms, when the patient is at ease, have the natural degree of force and steadiness indicating that there is at least no decided weakness of the muscular structure from fatty degeneration, there is strong probability that the case may be conducted to a favorable termination, or in other words, that the patient may permanently recover.

Treatment.—As has been clearly indicated, the statements I have already made regarding the classes of patients subject to these attacks, and the influence of certain habits and pathological changes in per-

petuating them, lead directly to the inference that the painful paroxysms which constitute the affection we are considering are symptomatic, *i. e.*, not founded necessarily upon any fixed morbid conditions of the heart or structural changes. The treatment which demands the careful consideration of the physician is to be viewed in two relations: first, in relation to the means most efficient for the speedy relief of the patient during the paroxysms; second, the removal of the causes, when possible, including all habits and circumstances which would favor a return of the paroxysms. The one has for its object temporary relief, the other permanently securing the patient exemption from a repetition of the paroxysms of suffering. At the present period of time, it is quite common to relieve the patient when the physician is called in the midst of a paroxysm, by immediate resort to the hypodermic injection of morphia. There is no doubt but so far as securing the temporary relief is concerned the hypodermic injection constitutes one of the most speedy methods. It is subject, however, to two serious objections. The first is the danger which is involved, especially in such cases as are accompanied by structural changes in the heart, of a character that greatly weakens or impairs its systolic action. When the muscular force of the heart is much impaired, especially by fatty degeneration, the sudden induction of the narcotizing effect of morphia is liable to be followed by fatal stupor. Especially is this true if the patient is unduly sensitive to the effects of opiates, or if the point of the syringe passes in such a direction that it enters some small blood vessel, and consequently places the remedy at once in the blood and develops its effects with extreme rapidity. There is some risk that it may speedily suspend the sensibility and action of the cardiac nerves, and lead to immediate death. At least two cases of death under such circumstances have come within the circle of my own observation. This danger should certainly make you very cautious about the quantity of morphine introduced in this sudden manner. If it is resorted to at all, it is much better that the dose be too small for full relief, necessitating its repetition in half an hour or hour, rather than to risk the sudden development of the effects of a full dose at once, with perhaps an imperfect knowledge of the ability of the heart to carry on the circulation. And in addition to this, many patients who have no danger from structural disease of the heart, nevertheless are uniformly susceptible to secondary nausea and severe sickness for many hours whenever morphine or preparations of opium are introduced sufficient to produce even a moderate anodyne effect, requiring sometimes one or two days for the stomach to regain its ability to retain nourishment. The patient is thereby caused more suffering in the aggregate than he would have endured during the brief period of the duration of the paroxysm if left alone. The second danger arising from the use of hypodermic injections of morphine consists in its tendency to speedily create the necessity for its repetition at shorter intervals. For, in almost all cases, while the direct effects of the morphine may relieve the patient at once, its frequent repetition so impairs the tone of the nervous system as to greatly increase that feeling of exhaustion which alarms the patient, and causes him to become clamorous for its repetition on every threatened recurrence of the paroxysm. And hence it requires but a few months for the patient to become thoroughly habituated to the effects of the morphine and unwilling to be without it even for a day. It has the effect of leaving him with a sense of depression, goneness and weakness that makes him exceedingly uneasy until the anodyne effects of the remedy are renewed. That I am not giving you useless caution, is certain from the fact that I have seen cases

in which the resort to hypodermic injections in this and similar nervous affections has led to the most serious disturbances on account of the development of a strong opium habit. In one of these cases it was actually carried to such an extent that the patient insisted on having one hypodermic injection in the morning and one in the evening every day, and it was not discontinued until mental derangement finally ensued, and it became necessary to remove the patient to an asylum for the insane. Therefore, if other remedies are a few minutes less speedy in their effects and less perfect in the direct relief they afford, it is better to use them and in the end, much to the advantage of the patient rather than to resort so readily to the rapid introduction of morphine. As the gouty diathesis is not an infrequent accompaniment and in fact a predisposing cause of paroxysms of this disease, in such cases there is perhaps no remedy that can be administered by the mouth, that will afford more speedy relief than a combination of the acetated tincture of opium and the wine of colchicum root, equal parts, of which ten to twenty minims may be given in a little sweetened water, and repeated every thirty minutes till the patient is relieved. But if instead of the gouty diathesis with which you have to deal, the patient is one of those who, from much confinement indoors or the habitual use of fermented drinks, has accumulated a large amount of fatty tissue with some degree of fatty impairment of the heart, one of the combinations most likely to relieve him from the distress of the paroxysm, is that of the tincture of digitalis, one part, and what is very generally known as Hoffman's anodyne, two parts, of which from twenty to thirty minims may be given and repeated every half hour till the patient is relieved. Quite a variety of antispasmodic, slightly stimulant and anæsthetic remedies, may be used for the relief of the paroxysms according to the circumstances and the convenience of the physician and his patient. In addition to the internal remedies, it will generally help to afford relief if a strong mustard sinapism is applied to the space between the left scapula and the spinal column, and another directly opposite on the left side of the chest, allowing them to remain until the skin is red, but not till blisters are actually raised, then removing them and substituting in their place cloths wrung out of water as warm as can be comfortably borne. But in many instances when the physician is called to these patients, the time which elapses before his arrival will be such that the paroxysm has already disappeared and he finds his patient comparatively comfortable. The question then is how best to accomplish the second object of the treatment, that is, to prevent a recurrence of the paroxysms in the future. It is entirely obvious to your own mind, from what I have said of the patients themselves and the variety of causes to which they may have been subjected, that no one remedy or combination of remedies can be recommended for this purpose. Here the great object to be accomplished is to ascertain whatever errors exist in the modes of life, habits of eating, drinking, exercise and dress, that would have a tendency to predispose to, and provoke these attacks; and to correct all such habits whatever they may be, and thereby remove the ordinary causes of the disease. If the patients are debilitated, the bowels inactive and the digestion enfeebled, it is highly proper to recommend such course of treatment as is calculated to obviate these several coincident conditions. Whatever will improve the general tone of health and render the processes and functions of the human body more natural, healthful and vigorous, will strengthen and tend to protect the patient from a recurrence of the paroxysms of this dreaded affection. It is particularly desirable to have the patient avoid the too free use of strong tea

and coffee, and to rigidly abstain from all alcoholic beverages, either fermented or distilled, and to adopt such regular, moderate and daily outdoor exercise by riding or moderate walking, as may be best suited to sustain the strength of the patient, promote the oxygenation and decarbonization of his blood, and to sustain the functions of digestion and assimilation. At the same time it is quite necessary to give immediate attention also to the mental habits of the patient. All excessive mental application, either in studying, writing or any other process must be avoided. The occupation of the mind, like that of the body, should be sufficient to engage the attention, relieve the monotony of idleness, give the content that is derived from doing a little something every day, and yet there should be a careful avoidance of intensity of mental application or the entering upon such business as will bring anxiety of mind in regard to results.

LECTURE LXXXVII.

Exophthalmic Goitre—Fatty Degeneration of the Heart – Aneurism.

GENTLEMEN: The assemblage of symptoms which has given origin to the name, *exophthalmic goitre* are met with not very frequently in ordinary practice, but they are sufficiently characteristic to merit separate consideration. As the words *exophthalmic goitre* would seem to imply, the three prominent symptoms characterizing all the cases belonging to this group, are enlargement of the *thyroid gland*, prominence of the eyeballs, and extraordinary or unusual action of the heart and the larger blood vessels, embracing particularly the aorta, subclavian and carotid arteries. It is most frequently met with in females, though not exclusively so. Much the larger number of cases occur between fifteen and thirty years of age; in most instances the symptoms are developed slowly, and generally the first to attract the attention of the patient is an unusual excitability of the heart. This causes throbbing or unusual pulsative action of the heart, extending to the vessels of the neck, in a less degree to the head, often preventing the patient for a time, if lying down at night, from going to sleep, and accompanied by more or less feeling of choking or tightness around the neck and upper portion of the chest; soon it is observed that the thyroid gland is decidedly larger than natural, giving the usual prominence to that part of the neck. This enlargement of the gland differs from that of ordinary goitre in being softer, more compressible, and being accompanied by a direct, plain, pulsation in the vessels of the gland. Usually in two or three months after the beginning of the cardiac excitability and the vessels of the neck become troublesome, it begins to be observed that the eyeballs are more prominent, or project forward more than natural. Generally there is at this time also more or less pain in the frontal region of the head, though not always; in some cases there is dizziness, sometimes ringing or noises in the head and ears and a disagreeable pulsation in the carotid and temporal arteries. When these patients lay the head down at night they are constantly annoyed by the unusual pulsation and deterred from sleep. In young females, there is frequently an additional complication during the progress of the disease in the suppression of the menses. This does not always occur, but in

several instances coming under my observation, they have become entirely suppressed during the progress of the disease, adding much to the anxiety of the patients and their friends, and sometimes leading to alterations in the blood, indicated by the old name chlorosis. If no measures are taken to interfere with the disease, the eyeballs become remarkably prominent, giving a peculiar expression to the face, the thyroid becomes so large as to make a decided tumor upon each side of the neck, and in some cases extending across from one lobe to the other, and the vessels entering into it so much enlarged and pulsating, that it gives them many of the qualities of a large anastomosing aneurism. The vessels are capable of being emptied to a considerable degree, and the swelling reduced in size by steady pressure; but they fill again with a plain pulsating motion of the blood, and fully distend the tumor as soon as the pressure is removed. It is in this way that you can distinguish these enlargements of the thyroid from ordinary simple goitrous tumors or hypertrophy of the thyroid gland. The increased size of the thyroid, and consequent greater feeling of embarrassment about the neck, is accompanied by a corresponding increase in the excitability of the heart, with a sense of fullness or vertigo in the head, which sooner or later so interferes with the movements of the patient as to cause almost entire confinement to the house, but seldom to the bed. There is usually no febrile heat accompanying any part of the progress of these cases, unless from the accidental supervention of local inflammatory action, not constituting a part of the disease proper. Physical examination by percussion usually elicits only negative results, there being no increased dullness over any part of the chest. Auscultation, however, pretty uniformly reveals a blowing or bellows murmur, both over the heart and over the course of the aorta up to the subclavian and carotid arteries, and frequently it is quite as loud and distinct over the vessels last named at the lower part of the neck as over the heart itself. The bellows murmur heard in these cases is free from roughness and harshness. It has none of the rough, harsh quality belonging to the bellows murmer caused by valvular disease, and particularly by the indurated condition of the mitral valve so frequently resulting from acute rheumatic attacks. If the disease continues for a long period of time, the over-excitement of the heart leads in many cases to dilatation of its cavities with thinning of their walls. The disease has no definite tendency to a self-limited duration, although in a few instances of the milder grade, spontaneous recoveries have taken place; yet the great majority of cases are liable to persist through an indefinite period of time, and in a considerable proportion of them to develop such structural changes as to finally induce a fatal result.

Causes.—The causes which give rise to this form of disease are so obscure as to have hitherto eluded any certain identification.

Pathological Changes.— In such cases as have terminated fatally, the heart and larger vessels have presented no uniformity in their morbid conditions. When the disease has existed for a number of years before the fatal result, the cavities of the heart have been found much dilated, the coats of the aorta affected by atheromatous degeneration, and the vessels of the thyroid greatly enlarged, as well as those in the posterior part of the orbit of the eye. Some observers have detected changes of a morbid character in the cervical ganglia of the sympathetic nerve. The theory that the disease has its origin in a morbid condition of the vaso-motor nerves, or that portion of the nervous system ramifying in the coats of the vessels of the heart and of the large arteries in the chest and neck, influencing their functions in such a way as to favor dilatation of the vessels

and a yielding to the pressure of blood in them, coincidently with an increase of the excitability, is as plausible as any that has yet been proposed. But what particular influences are operating in most cases to induce such a change in the nerves, and consequent calibre of the vessels, is not apparent; clinical study having detected no uniformity in the influences that are traced as operating upon different patients sufficient to explain such results.

Treatment.—The treatment in these cases, when commenced early, and pursued with a degree of patience and judiciousness will often result in recovery of the patient. But it requires a considerable length of time and judicious adjustment of remedial agents, in connection with the hygienic management of the patient, to afford any chance of so favorable a result. The primary object in the treatment consists in such a regulation of the heart's action, as to lessen the morbid excitability of the vessels and reduce the flow of blood through them more nearly to the natural standard of quantity and frequency; in other words to bring to bear upon the heart and larger vessels such a sedative influence as will hold the cardiac and vascular excitability in check steadily through a considerable period of time. My own experience has led me to place more reliance upon a combination, or at least, coincident use of digitalis, scutellaria and ergot, for the accomplishment of this purpose, than upon any other remedies. Several cases that have come under my care within the last few years have been greatly benefited by these agents, given in such doses and with such degrees of frequency as to develop the slowing influence of the digitalis upon the circulation, together with the tonic or contracting effect of the ergot upon the vascular system. If the bowels are inactive, suitable remedies should be prescribed for their regulation. If the kidneys fail to secrete the usual amount of urine, diuretics should be added. Attention should be given to the skin, and if inclined to be dry or deficient in eliminations, it should be subjected two or three times in the week to a warm bath, followed by frictions of flannel and the constant wearing of flannels next to the skin to protect the surface from sudden atmospheric changes, and keep the eliminations more uniform. The diet should be so regulated as to afford the patient sufficient plain, easily digestible food for a good degree of nutrition, and yet, all stimulating, indigestible materials should be carefully excluded. The regulation of exercise is also a matter of much importance. It is desirable that patients laboring under this affection should have invigorating outside air, but it is better that they obtain this by riding or by frequent short walks, than by any more protracted and severe exertion. Indeed, the latter should be carefully avoided. The patients should be encouraged to take much rest, and exercise but a short period of time continuously, either in-doors or out, and to so regulate their business and movements as to favor quietude of the circulation, and as much freedom from excitement as possible. If the menstrual flow has either become scanty and pale, or interrupted altogether, this should not be entirely neglected in adjusting the treatment of the patient. In one instance recently under my care, in which the menses were suppressed, the patient appeared to derive much benefit from taking in addition to the digitalis, scutellaria and ergot, a pill composed of thirteen centigrammes (gr. ii) of gum guaiac, six centigrammes (gr. i) of sulphate of iron, three centigrammes (gr. $\frac{1}{2}$) of pulverized aloes, and two centigrammes (gr. $\frac{1}{3}$) of blue mass, of which one pill was taken after each meal time. The guaiac was given to encourage a return of the menstrual flow and to act as a general organic tonic. Another remedy, however, which is perhaps more generally recommended and used than any I have

named, is the application of electricity, or electro-magnetism. I have certainly seen a number of patients greatly benefited, and two who apparently recovered, chiefly through the persistent use of electro-magnetism. The mode of application was to place the positive pole of a battery to the nape of the neck,or immediately below the occipital region, and the other at different points from the lower part of the neck to the ensiform cartilage, in making the currents gentle, simply sufficient for the patient to feel their influence, and avoiding all shocks or severe disturbance, and continuing the electric influence from ten to fifteen minutes each day. Sometimes the mode of application was varied, the patient taking one pole in each hand, and allowing the current to pass in the usual way from one hand, through the trunk of the body to the other. More frequently, however, when extending the application a distance from the back of the neck and the region of the sternum, I have kept one pole below the occiput in the upper part of the neck and placed the other at the bottom of one of the feet; and in a few instances I have varied the use of the electricity in such a way as to charge the patient's system with the electric fluid by insulating her upon an insulating stool. To make these or any other remedies effectual in the treatment of this form of disease, each patient must exercise patience and perseverance, both in the application of the remedies and in the general hygienic management, as I have already indicated.

Fatty Degeneration of the Heart.—I shall detain you only for a few words in regard to fatty degeneration of the heart. It is a condition which usually results from the slow and long continued defective oxygenation and decarbonization of the blood. When once fairly established it creates that weakness of cardiac action which greatly embarrasses the patient whenever attempting to take active exercise. Most patients subject to this condition of the heart, whenever quiet, either in the recumbent position or in the sitting posture, enough inclined to be at ease, are hardly conscious of the existence of any embarrassment. But they have no power of endurance. A very moderate attempt at exercise, as in ordinary walking, particularly ascending hills or going up-stairs, causes extreme rapidity of the circulatory movements, accompanied by a sense of oppression, or weakness across the chest, and such a degree of mental anxiety as usually induces the patient speedily to seek a position of rest. A soft, weak, slightly accelerated pulse, diminution of the impulse of the heart in the cardiac region, shortness of the systolic action, and the inability to exercise, constitute the symptoms most characteristic of this form of trouble. The best mode for its management consists in inducing the patient to so regulate his diet as to avoid all indigestible articles, and yet secure a sufficient supply of food to afford a fair degree of nutrition; to take food at such times in the day that digestion is always completed before the time for sleep at night, and to avoid all severe physical exertion. Yet the patient should obtain, either by riding, or very short and quiet walks, more or less of out-door exercise daily. Patients laboring under this condition of the heart, when not subject to paroxysms of angina pectoris, or any other special complication, are nevertheless easily tired, and readily exhibit a relaxed condition of the skin, with perspiration sufficient to keep the surface damp, and sometimes even to dampen the underclothes, and of course whenever exposed to currents of air feeling at once chilly, and morbidly sensitive to atmospheric changes. They not only become weary from trifling exertion, and short of breath, but they are subject to a great sense of weakness across the chest, and anxiety, as though stoppage of the heart's action was immediately pending. This impression is

added to by the occurrence, with many of the patients, of irregularity in the movements of the heart, consisting of two, three or four systolic beats or contractions in quick succession, then stopping perhaps long enough to omit one beat, and resuming anew, with a short and distinct interval; then a variation to the irregular, rapid, systolic movement, and then a return as before to a slower, and sometimes intermitting condition. The heart and the pulse thus become weak, variable, and sometimes intermitting.

Treatment.—The treatment of this class of cases consists mainly in the proper regulation of the patient's exercise, diet, habits, mental and physical, in such manner as to avoid, as far as possible, undue excitement, and too great an amount either of mental application or of mental worry and fatigue. The anatomical changes resulting from fatty degeneration are in most cases a slow atrophy or thinning of the walls of the heart, with corresponding enlargement or dilatation of the ventricles. It is this kind of disease of the heart that renders patients most liable to sudden death. For as the muscular structure becomes more and more degenerated, and consequently has less and less contractile power, with some degree of dilatation of the ventricles, it arrives at a stage of weakness, when at the moment of some moderate degree of exertion, as in rising from bed or in taking up some moderate weight and carrying it a few steps, the heart cavities fill with blood, their walls fail to contract, the heart stops in diastole, and the patient dies instantly, exhibiting paleness of features, or an almost bloodless condition of countenance and conscious only of a reeling in the head and dimness of vision as they sink to the floor. As the heart first ceases to act these cases have been called death by syncope. As I have just said, the leading objects in the treatment of these cases are to regulate properly the patient's habits, mental and physical, and to administer such remedies as will increase the force and lessen the frequency of the cardiac action and arrest further molecular degeneration. Digitalis, cactus and convallaria are perhaps the three remedies on which we can rely more than on any others to increase the force, lessen the frequency and thereby render more efficient the circulation of the blood. The doses of these remedies must be apportioned to the age and condition of the patient, in beginning with moderate doses, and gradually increasing until the pulse becomes slower and more full, then recede a trifle, aiming to continue the influence without causing it to become exaggerated. In cases accompanied by much general deposit of fat throughout the system, I have thought that the patients derived positive benefit by taking from three to six decigrams (gr. v to x) of the chlorate of potassium in dilute solution with mucilage of gum arabic and water after each meal. The increase of the chlorine salt in the blood, when thus administered, I have reason to think is capable of increasing the amount of oxygen taken up from the air cells of the lungs, and consequently of increasing the oxygenation and decarbonization of the blood, and in the same proportion checking the progress of the tissue degeneration. Consequently, when the stomach and bowels will tolerate moderate doses of the chlorate, administered in this manner for a considerable period of time, it is capable of doing much good. If the appetite is poor, adding a few drops of hydrochloric acid to each dose of the solution of chlorate of potassium will frequently improve the appetite and render the digestion of food more active and complete.

Aneurisms.—Aneurisms are usually classed with surgical diseases, and treated of fully in surgical works; and yet the management of aneurisms located upon the heart or aorta are usually entirely beyond remedy by surgical means, and are consequently left generally for the management

or palliation of the ordinary medical attendant. You will, therefore, sometimes be required to take charge of, and endeavor to counteract the progress of this class of affections. For a full discussion of aneurisms of the heart and aorta, I must refer you to surgical works, and will only detain you for the purpose of suggesting a few simple rules in regard to the best modes for their management. When fully formed, there is but little hope of cure. A true aneurismal tumor or dilatation of any portion of the walls of the heart, of the coats of the aorta or larger blood vessels connected with it, neither admits of being treated by surgical operation on the one hand, nor, on the other hand, are there known any means or agencies of a medicinal character capable of contracting these dilated pouches or aneurismal sacs, and restoring them to their natural condition. If you coagulate the blood in them by astringent injections or otherwise, you incur the great risk of having portions of the coagulum carried as emboli into the vessels of the brain or lungs and producing speedy death. There is also risk of ulceration at the point of puncture, and fatal hemorrhage. Yet judicious management of such cases may greatly increase the strength of the patient, retard the natural increase in size of the aneurism, and consequently materially prolong the life of the patient. To accomplish these results all patients afflicted with aneurism of the heart or great vessels in the chest should be instructed to avoid all active exercise, sudden exertion, or active manual labor, and yet they should be encouraged to take a moderate amount of quiet out-door exercise either by riding or moderate walking every day. To render life useful, occupy the attention, and thereby relieve them from misanthropy and continual dread, they may be encouraged to engage every day in some light occupation, or attending to any business that can be done by riding, and yet the mind should not be over-tasked or rendered anxious on account of pecuniary results. The clothing should be strictly adjusted for comfort to the seasons of the year and climate, attention should be given to all the various functions, with a view to keeping the digestive organs in as perfect order as possible, and the secretions and eliminations at their natural standard of activity. In addition to this, the direct treatment on account of the aneurism should consist in the administration of such remedies as will lessen the force and frequency of the current of blood, filling the aneurismal tumor, as far as it can be done, without seriously debilitating the patient. For this purpose the use of the well-known arterial sedatives judiciously adjusted, constitute our greatest reliance. In former generations, copious bleeding was resorted to with the idea of lessening the fullness of the vessels and consequently encouraging contraction or lessening of the aneurismal sac. This, however, is productive of no benefit except in some rare cases, where the general condition of the patient is one of actual plethora. In such a case the abstraction of just enough blood, once or twice in the year, to remove any excess or positive plethoric condition might be desirable. Few patients, however, laboring under aneurismal disease, possess any such plethoric condition. But the doses of digitalis, veratrum viride, aconite, gelseminum and perhaps convallaria, can usually be so adjusted as to suit almost all classes of patients, and keep sufficient sedative influence upon the heart, to greatly promote the comfort of the patient and prolong his life. When the habits or temperament of the patient has been such as to encourage fatty or atheromatous degeneration of the walls of the vessels, three decigrams (gr. v) of the iodide, or six decigrams (gr. x) of the chlorate of potassium, given after each meal time, in a wine glass full of sweetened water or of mucilage, will, in some cases at least, do much good.

LECTURE LXXXVIII.

Functional Derangements of the Stomach and Organs of Digestion—Their Nature and Treatment.

GENTLEMEN: The words dyspepsia, indigestion and constipation, though in very common use to indicate a class of functional disorders of the stomach and alimentary canal, nevertheless indicate no one special pathological condition. They are derived from the prominent symptoms rather than from any particular relation to the morbid conditions on which these symptoms may depend. As you perceived while listening to the discussion of the subject of gastritis in its various grades, indigestion was one of the more prominent symptoms accompanying one of the forms, or grades of that disease. And as we have already discussed fully that subject, including gastric hyperæmia, and hyperæsthesia, we have now only to consider that large and almost constantly recurring class of cases, in which the prominent symptoms are imperfect digestion of food, arising from conditions independent of local inflammatory action. Leaving out of view all grades of the latter, we may still have perhaps three distinct and recognizable conditions of the stomach, more particularly of the structures entering into the composition of the mucous membrane, which, though giving rise to the common symptoms of imperfect digestion of food, accompanied by more or less distress to the patient, are essentially different in their nature, and require different methods of treatment. Proper nerve sensibility, the normal amount and quality of the gastric juice, and the proper muscular motion of the stomach, are the three essential requisites for the performance of healthy digestion. It follows then, that a failure of either of these three would be likely to derange the process, and lead to imperfect results, sufficient to inconvenience or distress the patient. A close examination of patients will enable you to distinguish cases depending upon each of these three derangements separately, but perhaps more frequently cases, that depend upon the coincidence of two of them at the same time. The coincidence of defective secretion of gastric juice with insufficient peristaltic motion constitutes the most common condition of ordinary indigestion, especially in patients of sedentary habits, or who are much confined by their occupations, in-doors. The alterations of nerve sensibility, as a source of derangement of digestion, is of less frequent occurrence, and yet, there are some cases depending upon this cause, and if not recognized, they are very liable to be protracted in duration and exceedingly troublesome, both to the physician and patient. The alterations of nerve sensibility may be either reflex, as when derived directly from morbid conditions in the nervous centers from which the nerves concerned in the functions of the stomach are derived, or in the gastric nerves alone. You are aware that in addition to a supply of nervous filaments from the vaso-motor, or ganglionic system, an important supply comes also through branches of the pneumogastric, connecting the mucous membrane of the stomach directly with the brain, and constituting the medium through which impressions may be transmitted from the cerebral centers to the stomach, or the reverse. That conditions of the brain, as to excitability, or the activity of mental processes, are capable of radiating an influence through the pneumogastric nerves upon the secretory structures of the stomach sufficient to produce marked alterations in the secretions, both in regard

to their quantity and quality, is easily illustrated by investigating the effects of strong mental emotions, passions, or even of intense and continuous intellectual activity, soon after taking food. Nothing has been more fully determined than that these conditions are extremely liable to arrest the digestion of food, lead to its fermentation, and all the phenomena of a severe paroxysm of indigestion. It is on this account that persons engaged in intellectual pursuits, including those who are engaged as accountants and book-keepers, who are in the habit of resorting to their work immediately after their meals, are so very liable, in a few years and sometimes in a few months, to become habitually troubled with indigestion. But there is another and different condition of the gastric nerves which interferes with digestion, namely, a true hyperæsthesia of the nerve filaments, rendering the membrane so sensitive that food, when taken, will not be retained, but rejected almost as soon as it is swallowed. There is no appearance of gastric inflammation, nor any quickening of the pulse, tenderness over the epigastrium, nor any of the symptoms that usually indicate inflammatory conditions, not even a reddened condition of the tip, or edge of the tongue; but in the absence of all these, a degree of morbid sensitiveness, the prompt rejection of food within a very few minutes after it is received into the stomach with hardly a consciousness of nausea, and usually, in the same condition in which it was originally taken, without having undergone either digestion or fermentation. Such cases are not of frequent occurrence, and yet I have met with a considerable number of them during my clinical experience. Such patients take food with apparent ease, but hardly have time to more than turn away from the table before they eject it in the same condition in which it had been swallowed; and they sometimes feel a decided disposition to turn back and eat as much more. If they do, it is usually ejected in the same manner. Such persons, by taking a very small quantity, will sometimes retain it, and it is probable that they rarely reject all the food they take at any one time, because few of them really become emaciated. I have seen some instances where the patients would thus promptly reject a large part of the food after almost every meal for months, and yet lose but little flesh, and exhibit but little indication of anæmia. I need not remind you that the vomiting so frequently observed during the early months of pregnancy, is reflex in its character from irritability in the nerves of the uterus being transmitted to the nervous centers, and from there reflected upon the stomach. And in many of the acute diseases, particularly inflammations involving the nervous centers, unusual vomitings are among the first symptoms to attract attention.

The best mode of managing reflex cases of indigestion, is to carefully ascertain the habits and influences affecting the patient's daily life, with a view of ascertaining if possible the causes and circumstances which have induced the morbid sensibility of the gastric nerves. If there is any focus of irritation in other viscera that reflects a disturbing influence upon the base of the brain, or origin of the pneumogastric nerves, and through them upon the stomach, so far as possible the primary seat of irritation must be relieved before permanent relief of the gastric symptoms can be expected. If the source of morbid sensitiveness is in the brain itself, whether derived from intense mental application, or indulgence of the emotions and passions, particularly during the first stage of digestion or soon after eating, or any other cause capable of producing undue determination of blood to the brain—these conditions must be ferreted out and corrected, as a necessary part of the treatment, if relief of any permanent character is to be obtained. It is a good rule for every person to

avoid engaging in intense mental work for the first half hour after taking an ordinary meal, and if possible to spend that time either out of doors or where they have a full access to fresh pure air. It is well known from physiological experiments, that oxygen is taken up from the air cells of the lungs very much more rapidly during the first hour after taking an ordinary meal, while digestion is going on actively, than at any other period of time. This would indicate that the patient during such time, or the early part of digestion, should have the freest access to pure air, and that the process of breathing should be untrammeled, accompanied by light physical exercise or mental diversion.

There is no doubt but the observance of this simple rule in regard to leaving the mind habitually in a state of ease, with a full, free access of air during the first half or three quarters of an hour after taking an ordinary meal, would prevent a very large amount of imperfect digestion of food, and save a great many individuals from becoming confirmed invalids through imperfect digestive processes. When this rule has been habitually violated and patients are suffering from indigestion in consequence, it is in vain to endeavor to cure them by drugs or do anything more than simply to palliate some of the more prominent symptoms from time to time, unless the rule is enjoined, and it is literally complied with. In regard to medicine for the class of cases dependent upon pure morbid excitability of the nervous structures, it is desirable to select and use some agent calculated to produce as direct a soothing or sedative effect upon the sensibility of the nerves involved, as is possible. The best time to make an impression is immediately before taking food. In some instances I have obtained very prompt and entire relief by giving, just before the patient sits down to take his meals, six decigrammes (gr. x) of bromide of potassium with the same number of minims of the fluid extract of hyoscyamus in a tablespoonful, or four cubic centimeters of water. The bromide and hyoscyamus in many such cases when taken just before taking food, coming in contact with the sentient nerves of the mucous membrane, produce their full sedative effect, lessening the nervous excitability, and by absorption and diffusion extend some of the same soothing or calming influence over the whole central portion of the nervous system. If, as sometimes happens in these cases, there is some tendency to fermentation, causing the formation of gases and eructations, the addition of small doses of carbolic acid to the bromide and hyoscyamus will increase the efficacy by acting as an antiseptic. It is also moderately sedative to nerve excitability and therefore makes a valuable addition to the other two ingredients. In the same class of cases moderate doses of hydrocyanic acid, taken in mucilage of gum arabic, have also frequently succeeded in removing the undue sensitiveness and causing the food to be retained and assimilated. As I have said before, the larger number of cases of ordinary indigestion, as they are met with in practice, depend upon the coincidence of defective secretion of gastric juice with impaired peristaltic motion, not only of the stomach, but of the whole alimentary canal, and causing the indigestion to be associated with more or less habitual constipation. This condition is of very frequent occurrence in modern society among all classes who are not engaged freely and abundantly in physical exercise out-doors, but more especially common among the female sex, who in addition to being much in-doors and neglecting active ordinary exercise on foot in the open air, also by their modes of dress confine the chest in such a way as to limit the habitual expansion of the lungs, and the consequent consumption of oxygen and the elimination of carbonic acid gas. By the coincidence of in-door life, little phys-

ical exertion, and daily restricting the function of respiration so as to make the amount of oxygen consumed and carbonic acid eliminated a few cubic inches below the normal standard, the blood is caused to circulate through the whole arterial system, holding in solution an excess of certain effete constituents, especially carbonic acid gas, which is a direct sedative to nerve sensibility, and a deficient supply of oxygen as an excitant both of nerve sensibility and muscular contractility. The inevitable result of such a condition, continued for any considerable time, is the impairment of the tone of the whole muscular system, voluntary and involuntary, including such as constitute the muscular coat of the stomach and intestines equally with those of voluntary motion, and of the susceptibility of the whole nervous system, both central and peripheral. One of the consequences is an impairment of the involuntary muscular movements, including, particularly, those of the alimentary canal throughout its whole course. Persons of this class consequently seldom arrive at the middle period of adult life before they have developed both habitual constipation, and imperfect digestion of food. The food, though taken with a moderate appetite, is found to lay simply like a load, or dead weight, in the epigastrium after eating. Sometimes this is so marked as to be described as feeling like pieces of lead in the stomach. This dull, heavy feeling is accompanied by more or less general feeling of fullness and depression, and not infrequently, mental despondency. In many cases it is not felt perceptibly until about half an hour after eating. Then it gradually increases, the load and sense of fullness become more and more uncomfortable, until in from one to two hours there is added the liberation of gases; and what was previously a simple feeling of heaviness, now becomes a very distressed feeling of distension in the epigastrium until the gases begin to be belched up, generally in large quantities. After belching up quantities of gas, in most instances tasteless and odorless but sometimes having more of a nauseous and offensive quality, the feeling of uneasiness passes off, and the patient becomes comparatively comfortable till about the same hour after the next meal. And thus he passes day after day, month after month, suffering about the same length of time after almost every m al that is taken. Perhaps, in a majority of cases, the symptoms are simply those I have described, accompanied by constipation. But there are some in which there is not only a fermentation which results in the liberation of large quantities of gas, but more or less of acid also. And then you meet with eructations of a sour or acrid character. If so, there is usually added at the same time more or less of, burning sensation, or what is popularly called heartburn, and sometimes gastralgia.

In these cases there is usually a light degree of actual hyperæmia, or approach to an inflammatory condition of the mucous membrane, but so slight that it passes off as soon as the stomach becomes again empty. It is a very common practice to supply this class of patients with palliatives, including every variety of antacids, antiseptics, and sometimes stimulants, with a view of either preventing the formation of gases, which are supposed to be the chief cause of the patient's misery, or facilitating their expulsion when they have been formed. At the same time the constipation of the bowels is also very apt to be regarded as the evidence of biliousness, and every few days the intestines are emptied by an active dose of physic; but just as often they lapse back into the same inactive condition as they were in before the physic was taken, when another dose is resorted to. Hence such patients follow up the routine of taking all the varieties of pepsin, charcoal, alkalies and carminatives, interspersed with active physic, every two or three days, for months and sometimes years.

Such management, however, has no other result than that of simply palliating symptoms, but does nothing toward removing the pathological conditions from which the patient suffers, or the causes which have led to them. No beginner in the practice of medicine can take a better direction for ingratiating himself into the favor of a large number in the community, and laying the foundation for a popular practice, than by a careful study of this class of cases of ordinary indigestion and constipation, with a view of understanding clearly their causes and the pathological conditions they involve, that he may, whenever he comes in contact with a case, be able to put the patient upon such a course of correct habits of life, and such aid from well-directed remedial agents, as will give him a more permanent and satisfactory restoration. Such cases are curable with only a moderate use of medicine, provided the patients will adopt proper habits of life and avoid the causes which have produced them. Nearly all of this class of cases depend entirely on the two pathological conditions I have mentioned, namely, defective muscular or peristaltic motion of the stomach and bowels and the coincident deficiency in the secretion, both of the gastric juice and of the ordinary mucous from the follicles of the intestines. And the causes which have led to it, are in a very large majority of the cases, the coincidence of deficient out-door exercise, and either habits of dress or occupations that help to limit, or embarrass the free exercise of respiration, and thereby lessen the oxygenation and decarbonization of the blood. If to deficient exercise, and inefficient breathing, there is added constant mental application, it will hasten the development of evil consequences. The rational treatment of such cases is so plain that I hardly need take time to mention it in detail. It involves the correction of erroneous habits, as essential to its permanency. It is not difficult to temporarily relieve such patients, but for permanent relief, the causes which contribute to the development of the morbid conditions must be absolutely avoided. Consequently, exercise to a moderate extent in the open air at some part of every day, the exercise of the chest in such a way, daily, as to promote absolute full, free, efficient respiration, sleeping in well-ventilated rooms, the use of plain diet, the avoidance of all anæsthetics, like alcoholic drinks, and much better, if it include also avoidance of tobacco, are absolutely essential parts of the treatment of all cases where any permanent results are expected. There are not many patients but who, if the necessity for this part of the treatment is pointed out clearly, will sooner or later yield obedience to the requirements, although they may, if engaged in particular lines of business, protest at first that they have no time to do it. But there is no proper business in the world, and should be none engaged in by individuals anywhere, that does not leave, if time is properly economized, opportunities every twenty-four hours for taking the exercises which are needed for the class of patients under consideration.

If there are any exceptions to this rule, they are to be found among the poorer mechanics and artisans, whose work is habitually within doors in some confined position, and who must extend their hours to the utmost limit, to keep the poor family from suffering for the necessaries of life. But then they are rarely required to be at their labor earlier than seven in the morning, and usually at home as early as six in the evening, thus affording time both before commencing in the morning and still greater time in the evening before going to bed, to counteract much of the evil effects of the day's confinement by judicious exercise, in such manner as may be pointed out to them. I wish you not to forget that the exercise which is most valuable and most needed for promoting elimination of waste material, more effi-

cient oxygenation of the blood, its diffusion through the whole vascular system, and consequently the establishment of its influence over the functions of the body, does not consist mainly in mere walking, but involves, necessarily, daily exercise of the arms and muscles of the chest sufficient to keep the muscles concerned in ordinary respiratory movements in a vigorous and healthy condition. Having dwelt thus emphatically upon the portion of the treatment which relates to the hygienic management of the patient, which is really the most important of all, it only remains to study those remedial agents best adapted to such cases, and select such as will possess two distinct properties; one a tonic of such character as is calculated to increase the efficiency of the nervous and muscular actions concerned in the movements of the stomach and intestines, and with these just sufficient laxative to promote a single natural movement of the bowels once a day, without ever acting as a cathartic. If you can select from your materia medica any combination of agents that will present to the organic nervous system a tonic such as is calculated to increase the innervation and nerve sensibility, you will thereby increase the muscular contractility and movements, and with this such a laxative for a time during the early part of the treatment as will simply suffice to prompt a single movement of the bowels each day, you will in one week be able to so far correct the faulty action of the digestive organs as to have well-nigh established exemption from the prominent symptoms of indigestion which had previously tormented the patient. My remarks now in reference to remedies, as you will notice, include those most efficient and desirable for the removal of habitual constipation, as well as indigestion.

For a long period of years, I have been in the habit of prescribing for this class of patients a combination of the extract of hyoscyamus, sulphate of iron, aloes and nux vomica or strychnia, usually in the form of a pill. In prescribing for an adult, a pill containing six centigrammes (gr. i) each of the extract of hyoscyamus and sulphate of iron, and two centigrammes (gr. $\frac{1}{3}$) each of pulverized aloes and extract of nux vomica may be given before each meal, and if the patient is laboring under a very decided degree of constipation, another at bed time. And if, as sometimes happens in these cases, there is a yellowish coat upon the tongue, the urine a little redder than natural, and when cool, throwing down a whitish phosphatic or ammoniacal sediment, it will be profitable to add two centigrammes (gr. $\frac{1}{3}$) of blue mass to each of these pills. In many instances, giving these pills as I have indicated, there will be no direct effect in moving the bowels during the first two days. But if the patient does not resort to other physic by the third day, there will almost invariably occur an evacuation, which with a majority of patients will be costive, requiring some effort as usual to void it, especially at the beginning of the evacuation. Continuing the same number of pills, the bowels will move again the next day, but a little easier. The day following most patients will have two evacuations, showing the influence of a laxative. My rule is, to give definite instructions that so soon as the effects develop more than one easy natural movement a day, one pill is to be omitted, usually the one before dinner, allowing the patient to continue the one before breakfast, at tea time, and bed time. With many this will be found not merely to perpetuate one single movement a day, but after a few days to make the bowels a little more loose, and another pill can be dropped, leaving only one morning and evening; and still later another may be omitted, leaving but one to be taken every night. The great majority of such patients, by the end of the third week from the time they commence, will have an entirely regular, healthy condition of the aliment-

ary canal, with little or no trouble from indigestion while using only one pill each day. It is better that they continue this for a considerable time, but ultimately they can diminish this to one every second evening, and finally to once in three days. Then they can drop it entirely for a week or more at a time. After this it will be sufficient to follow the rule to take one pill at bed time whenever there has been no evacuation during the preceding twenty-four hours.

An additional item of much importance, is, that the patient maintain a strictly regular habit of going to stool at some given hour each day. Usually the best times to go are immediately after breakfast in the morning, or immediately before going to bed. A majority of patients will succeed best by going immediately after each morning meal. Proper attention to the hygienic measures I have indicated, combined with treatment by medicine on the principle I have clearly laid down, will succeed in ninety-nine cases out of a hundred in relieving this class of patients both of indigestion and habitual constipation. But there are at least a score of remedies and combinations that may be made from the tonics, especially of the class of nerve tonics, and such mild laxative remedies as are familiar to every student of the materia medica, besides those entering into the pill I have indicated. In those cases of indigestion presenting in addition to the mere load in the stomach and distension from the generation of gases, there is manifest during the process of digestion some sourness or acidity rising from the stomach, indicating acid fermentation, I have derived much greater benefit by giving patients a teaspoonful, or four cubic centimeters, of a combination I have often mentioned during this course of lectures, as the carbolic acid mixture. It contains carbolic acid, tincture of gelsemium, and camphorated tincture of opium in proper proportions, with a little glycerine and water.* Four cubic centimeters, (fl. ʒi) or a teaspoonful of this mixture in a tablespoonful of water taken immediately before the patient commences to eat, at each meal time, will have an important influence in correcting the process of fermentation, and greatly lessen the inconvenience that the patient suffers during the stomach digestion. Of course it will do nothing toward removing constipation and maintaining the natural muscular action of the stomach and bowels. To accomplish this, where I use the carbolic acid mixture before each meal, I direct at the same time a pill consisting of six centigrammes (gr. i) each of the extract of hyoscyamus, sulphate of iron, aloes and blue mass, with two centigrammes (gr. $\frac{1}{3}$) of extract of nux vomica, and allow this pill to be taken when the patient retires to bed at night. By this increase of the amount of aloes and blue mass to each of the pills previously mentioned, I have aimed to make them active enough for one pill taken at night to prompt the necessary movement of the bowels the next morning.

During the last ten years I have relieved, more satisfactorily and fully, a majority of cases of ordinary indigestion coupled with constipation of the bowels, by this process of giving the carbolic acid mixture immediately before taking food, and a tonic and laxative pill at bed time, than by any other means. But by no means, gentlemen, get the idea that either this or any of the formula I have given you are essential in the treatment of such cases. On the contrary, any combination you may make that does not contain a positively irritating material, and that will on the other hand act as a genuine tonic to the nervous and muscular structures entering into the alimentary canal, and will also gently promote the

* See page 138.

secretions of the gastric and intestinal glandular structures, with the proper regulation of the patient's habits and modes of life, will afford relief in almost all this numerous class of cases. After alluding to these general principles in regard to the treatment of the different forms of indigestion and constipation, I need not take up more time, but leave each one to his individual judgment and tact, in selecting the special remedies to fulfill the indications I have endeavored to point out. There are, perhaps, two painful conditions of the stomach, that are liable to occur more or less in connection with all grades of indigestion, about which a word or two should be said. I allude to gastrodynia, or pain in the stomach, and cardialgia, or burning in the stomach, but more popularly styled *heart burn*. The latter is almost always dependent upon either the generation of acid in the stomach, or a certain degree of inflammatory action. When the latter, it is best treated, as I have already pointed out to you when speaking of the forms of gastritis. When dependent upon acid, the remedies that may relieve temporarily are the antacids, alkalies, alkaline earths or substances capable of neutralizing an acid. Bicarbonate of soda, calcined magnesia, carbonate of magnesia used by themselves, or in solution and associated with some carminative, as cardamom, anise, or mint water, will usually, if given in moderately liberal doses, speedily neutralize the excess of acid and after giving rise to the formation and eructation of gases, relieve the distress of the patient. Of course this refers only to the paroxysms. If associated, as it generally is, with one of the forms of indigestion that I have already alluded to, permanent relief, or the prevention of the recurrence of such paroxysms will depend upon the removal of the pathological condition involved in the case.

Gastrodynia is a term applied, not to the ordinary sensation of uneasiness, load or burning in the stomach, but a distressing pain in the epigastrium, and often radiating upward behind the sternum, reaching as high as the lower part of the neck, and not unfrequently involving the sensation as if there was a great weight or pressure upon the whole anterior part of the chest, with an extraordinary intensity of pain directly in the epigastrium, yet at times also radiating backward, and becoming almost as intense in the central part of the dorsal portion of the spine as in the epigastric region itself. Most of such attacks are accompanied by, if not directly dependent upon, a rapid generation of gases, and distension of the stomach. In some rare instances the stomach, at least for the time being, seems to lose the tone of its muscular coat, and yields to the enormous distension, till finally, through some irritant influence the muscular coat is stimulated to contract, causing vomiting and throwing off of large quantities of accumulated material, to the speedy relief of the patient. I have frequently met with cases in which patients only moderately troubled with habitual indigestion and constipation, would be subject occasionally, through some cause difficult to trace, to failure in the digestion of their supper. Taking their evening meal at the usual time, they would pass the evening, especially the early part of it, without any more than moderate sensations of heaviness, and oppression near the lower end of the sternum, and retire, perhaps, exhibiting nothing serious. Falling asleep, in less than an hour, they wake up with extreme gastric distress, and with all the severity and character of the symptoms I have just previously described. Continuing in this condition, unless relieved by some remedies, for two or three hours, it ends in belching large quantities of gas, and sometimes vomiting the greater part of their evening meal in a sour and undigested condition. Immediately after this the pain begins

to abate, and very soon they are so far relieved as to fall asleep. Getting two or three hours of sleep, they rise in the morning feeling weary, more or less depressed mentally, but usually able to take a light breakfast. Going out in the open air soon after, they recover their usual spirits and buoyancy and frequently go weeks and months before another attack occurs. Some of these attacks of gastrodynia are almost as distressing as those of genuine angina pectoris and are of the same general character, only the pain is epigastric and generally associated with more or less gaseous eructations, while in angina pectoris the pain is more in the chest, radiating to the left arm and shoulder, and accompanied by irregularity of the heart's action. In these cases of gastrodynia, where it is evident that the patient's last meal is not digested and removed from the stomach, but is still lying there in a fermenting condition, having much to do in causing the suffering, the most speedy means of relief is the administration of a mild emetic, of which, perhaps, ipecacuanha is preferable to any other. Enough should be given to make sure of a speedy and free vomiting, aided by a liberal drink of warm water. By filling the stomach with warm water directly after a moderately full dose of ipecac, vomiting is quickly provoked. If there is a little slowness in the subsidence of the pain after the stomach has been freely evacuated, any mild anodyne and antiseptic, more particularly a teaspoonful of the carbolic acid mixture, will usually be sufficient to arrest the further progress of pain and speedily induce a state of sleep. Of course after this the main object must be to correct the faulty condition of the digestive organs which have rendered such attacks possible.

LECTURE LXXXIX.

Intestinal Parasites—Their Varieties, Symptoms and Treatment.

GENTLEMEN: The study of helminthology is one of sufficient interest to justify you in giving it much careful attention during the earlier years of practice, when time may be afforded for further special studies, beyond what the more crowded hours of the lecture room would justify. Those parasites which have been found in the human body have been usually classed as entozoa. Thirty or more different varieties have been recognized as occasionally found in some part of the human system. The principal ones may be divided into three classes: the *cestoid* or ribbon-like worms, *frematoid* or fluted worms and the *nematoid* or round worms. To the first class, or cestoid worms, belong the different varieties of tænia; as the tænia solium, tænia lata, tænia echinococcus, several varieties of cysticercus, and the bothriocephalus latus. The frematoid worms are usually flattened and somewhat fluted, corrugated and soft, and are found mostly in the interior and parenchyma of organs. The class of nematoid worms embrace the more common varieties as the ascarides, which chiefly inhabit the rectum; the ascaris-lumbricoides or common round worms, which more generally occupy the small intestines and sometimes the stomach; the trichocephalus, oxyuris vermicularis and trichina spiralis. It is not my purpose at the present time to occupy your attention with any of the more rare varieties of worms or those which

are found in the interior of solid organs and cysts. Echinococci in cysts of the liver and other parts, cysticerci found in the eye and some other places are so rare as to constitute curiosities in medicine rather than items of ordinary interest to the practitioner. But I shall occupy your time at the present hour, simply in a brief consideration of the symptoms and the best mode of treatment applicable to the removal of the three most common varieties of intestinal worms, namely, ascarides or pin worms, as they are sometimes called, the different varieties of lumbricoides and the tænia or tape worm. The two first varieties are found more frequently in the intestinal canal of children and young persons than in adults. While the different varieties of tape worm are quite as often, perhaps more frequently, found in adults than in children. The ascarides are a small worm, flattened, a little tapering toward the head, and usually occupying the rectum and lower part of the colon. They multiply with great rapidity, are often discharged with each evacuation from the bowels in considerable numbers, usually sufficiently alive to make their crawling movements with considerable facility; and when they are allowed to accumulate, they not infrequently crawl out of the anus in the intervals between the intestinal evacuations. The general symptoms to which they give rise are some tickling sensations or itching in the rectum and anus, together with some degree of increased nervousness or general excitability on the part of the patient. Their movements, not infrequently, apparently cause the child to start suddenly during sleep in the night, making him restless and sometimes starting up as in a fright. It is generally supposed that the existence of worms, especially of this variety, cause also more or less dryness and itching in the nostrils, thereby inducing the child to rub his nose frequently. But rubbing the nose and dryness of the nostrils may arise from so many different causes quite as readily as from the influence of worms, that they are of little or no value, as aids in diagnosis. In fact the only certain diagnostic sign is the finding worms as they are discharged with the fæces from time to time, or as they make their exit after crawling from the lower opening of the bowels between the evacuations. When they are allowed to accumulate for a considerable time, they undoubtedly are capable of exciting sufficient irritation upon the nerves of the rectum to induce a reflex influence upon the nervous centers and temporarily establishing febrile reactions, by which children become subject every few days to temporary paroxysms of fever in which the face will appear flushed, the skin will become hot, breathing a little hurried, nostrils more or less dry, the nervous system disturbed, indicated by startings and excitability; and perhaps in three or four hours the paroxysm passes off and the patient will be up and apparently as well as ever. In other instances, however, the worms may exist for a longer period of time without inducing any active, febrile paroxyms, giving rise to nothing more than nervous restlessness at night, and more or less itching and annoyance in the rectum. As I have already remarked this variety of worm is found discharged in large numbers with the ordinary evacuations from the bowels, or they may be dislodged also freely at any time by taking almost any variety of physic that will produce two or three free evacuations. But very frequently, purging will entirely fail to remove all the worms or their larvæ, and consequently they are reproduced in considerable numbers within one or two weeks, even if evacuating remedies have been used with as much freedom as is for the comfort of the patient. Generally the exhibition of vermifuges or special remedies, calculated to deaden the worms and cause them to pass off, produce less effect upon this variety than upon others occupying the upper or middle part of the bowels. Remedies calculated

to destroy these parasites, given by the stomach, in passing through the alimentary canal do not reach the worms in sufficient strength to produce the desired effect.

So little certainty is there of effectually removing ascarides or pin worms by the exhibition of vermifuge remedies by the mouth, that for many years I have almost ceased to use that class of remedies, and have very satisfactorily removed this variety of worms by means of enemas. The use of a solution of common salt in water in proportion of eight grammes (ʒii) of the chloride of sodium or common salt to half a pint of water, and this quantity, or as much of it as the rectum will permit, shouldbe given as an enema, endeavoring to have the patient retain it for ten or fifteen minutes. By using enemas of salt water, the saline having a poisonous effect upon this variety of worm, you not only destroy those that are already mature, but if the rectum is pretty well filled, it reaches almost certainly the larvæ also, and by destroying both, there is less liability for the worm to be reproduced and require treatment again in a few weeks or months. I have generally used the salt water enema twice a week for about two weeks in succession, and it is very seldom that this fails in entirely removing the further development of these parasites. If the bowels are inclined to be constipated it may be well, in addition to the use of enemas, to give the patient a mild laxative once a day, with which may be combined a few drops of oil of turpentine, which will be likely to reach and destroy any of the worms or their larvæ, that may be too high up in the alimentary canal for the enema to reach. Besides salt water as an injection, there are many other things that may be used in the same manner that would prove effectual for the removal of this variety of worms An emulsion made by rubbing up a certain amount of oil of turpentine and castor oil, with mucilage and water sufficient to dilute the enema will generally prove effectual, although it is less convenient, and usually not more efficient than solutions of common salt. An infusion of spigelia marylandica, mixed with a little senna, may also be used as an efficient injection or enema for the destruction of the worms inhabiting the rectum. The ascaris lumbricoides, or long round worm, frequently found occupying some portion of the small intestine and occasionally the stomach, may exist for an indefinite period of time, and produce so little inconvenience to the patient or positive symptoms by which their existence could be suspected that the patients have no thought of anything disturbing their health. And not infrequently, the first thing which causes them to think of worms is the discovery of a specimen mixed or incorporated with the fæces that have been discharged as ordinary evacuations. So true is it that in many cases there appear no symptoms of their existence, and many persons are found to pass large specimens every now and then, who are not conscious of suffering any symptoms of ill health. But where they multiply in the intestines until a considerable number have accumulated, they usually produce an obscure train of symptoms, such as chilliness, occasional paroxysms of fever, not having any regularity, but skipping a day or two, and then again returning, without any regularity as to the interval between their occurrence. Sometimes patients afflicted with these worms have a variable appetite, eating at some meals unusually voracious, and at others taking but little or none. The presence of the worms or their effect upon the nerves connected with the small intestines, has been supposed capable of exciting reflex disturbance of the nervous centers sufficient to provoke paroxysms of general convulsions. During a somewhat protracted period of practice I have seen but very few instances in which there was any satisfactory evidence that intestinal worms were the cause

of convulsions or more than very evanescent paroxysms of fever. The bowels are usually regular though sometimes they are inclined to constipation, at other times to diarrhœa. The same rule applies to the symptoms, which are so often regarded as indicating worms, namely, rubbing or itching of the nose. And the only means for positive diagnosis or determining whether this variety of worms exists, is in finding some of them in the evacuations. Occasionally one comes up in the œsophagus from the stomach, and is cleared out of the throat. I met a patient only yesterday, who had discharged a worm, apparently from its rising in his œsophagus, creating the sensation as if encouraging the act of vomiting, and a little effort threw out a worm of the round lumbricoid variety some four inches long.

Treatment.—A considerable number of remedies have been recommended from time to time for the removal of this variety of worm, any one of which will succeed in most instances, if it be given properly, and followed at the proper time by a moderately brisk cathartic. A very old and favorite remedy, in years gone by, was the spigelia marylandica. When a child or young subject was found to be affected by worms of the lumbricoid variety, the common practice was to take eight or ten grammes (℥ii) of the spigelia root, with an equal quantity of the senna leaves, to which was added sufficient water, boiling hot, to make 200, c. c. (℥vi) of the infusion. This can be given in divided doses, suited to the age of the patient, once in three or four hours until it produces three or four free evacuations. The spigelia, or pink root, is supposed to deaden the worms, while the senna, acting as a cathartic, causes their discharge. Equally effectual is it to give eight or ten minims of the oil of turpentine on a little sugar, or rubbed up with gum arabic and sugar in the form of an emulsion, three times a day for two or three days, and follow it by a moderately brisk cathartic. Another remedy which is usually efficient, is santonine; which from the smallness of the dose is more convenient of administration to children than either turpentine or the spigelia, though the latter may be obtained in concentrated form by giving the fluid extract. Santonine for children from three to five years of age may be given in doses of from one to three grains in the form of a powder, morning, noon and evening, and the next morning followed by a cathartic, or a dose of the santonine may be given morning and noon, and the third to be given at night, may be mixed with a sufficient quantity of rhubarb, powdered senna, or of calomel, to produce a free movement of the bowels. But the existence of worms in the bowels is much less frequent than is usually supposed by the greater portion of the community. A large portion of the cases of disease that are supposed to originate from worms are cases of simple irritation of the mucous membrane of the alimentary canal, or some morbidly excitable condition of the nervous system when there are no worms of any variety existing in the alimentary canal or any of the adjacent viscera. The tænia, or tape worm, occurs more frequently in adults than in children, but may be found at any period of life. It usually occupies the small intestines, and is far more difficult of dislodgment, or removal, than either of the varieties that we have just been considering. Like the two other varieties of worm, their existence is not productive of any absolutely characteristic or diagnostic symptoms, except the discovery of a portion of the worm in the discharges from the bowels. Indeed, a large majority of all the patients I have met, when annoyed with the existence of tape worm, have not been conscious of any particular ill health or even of symptoms of indigestion, till they accidentally discovered sections of the worm in the evacuations. Most patients

after they have learned that the worm exists in the alimentary canal, by witnessing the discharge of sections of flat and truncated pieces day after day, become annoyed with what they will describe as various unpleasant sensations derived from the presence of the worm. They will not infrequently speak of a crawling, creeping, turning, twisting motion of the bowels; sometimes having a voracious appetite, and at other times none at all. They generally become very nervous, and not infrequently complain of choking sensations in the neck like parties affected with hysteria. Most of these sensations, however, are evidently the result of mental education, and watching for some sensation in the abdomen, aided by the imagination of the patient, as to what would be the effects of the presence of the worm, more than what was actually felt, or that they had any knowledge of, prior to having become satisfied that the worms existed. And yet, it is probably true that the presence of this variety of worm, especially when it has attained considerable size, causes many obscure and annoying feelings in the abdomen, which are sometimes reflected to the central portion of the nervous system, giving rise to temporary periods of excitement or feverishness, disturbance of sleep at night, associated with a disposition to perform the act of deglutition, or a sense of choking in the neck. These worms sometimes attain great length, being broad, flat and jointed, tapering almost to a point, with a little bulb at the end constituting the head. This head in most cases is armed with antennæ, or little hooks, projecting from either side of the enlargement. The worm grows broader and keeps a distinctly flattened form as it extends in length until when it has attained a pretty full size, each section is from three to six lines wide and about the same in length. These pieces, although detached sections of the worm, are most of them, when passed, possessed of sufficient vitality to make very distinct and sometimes regular movements, such as contracting and extending in width, and crawling, or more or less of a progressive motion. But the difficulty for the physician is not usually in the diagnosis. The worm, when joints of it are presented, is easily recognized and its general habits and disposition for reproduction understood. But the chief point of interest, both for the physician and patient, is the best mode of treatment, or the one most certain to effect its entire removal. For this purpose quite a long list of remedies have been used, and from time to time, each in its turn has been recommended as efficient. The principal difficulty in removing this variety of worm, is in getting any medicine to reach it in sufficient strength to act as a poison or to so deaden the worm as to loosen its hold, or the grasp of its hooks, upon the folds of the intestines. Occupying a particular portion of the alimentary canal, and involved more or less in the fecal contents of the intestines, whatever is administered by the mouth, or by the rectum, becomes so diluted by its intermixture with fecal matters or removed by absorption before it has reached the worm, that it is not of sufficient strength to produce the desired effect upon the parasite. Consequently, if we would obtain the greatest degree of certainty in the removal of the worm by any particular plan of treatment, we will be very much more likely to succeed if the bowels are first emptied by the administration of sufficient laxatives, and the patient during the time of treatment abstains either from all nourishment, or from all solid food, taking at each meal time, only just such limited amounts of liquid nourishment as will prevent too great a degree of exhaustion from the abstinence. After emptying the alimentary canal, and taking a very small amount of liquid nourishment, the worm becomes exposed, or as free from envelopment by the contents of the bowels as is possible. Having placed the patient in this

condition, whatever remedies are chosen to exert a toxæmic or poisonous influence upon the worm should now be administered in sufficient doses, and repeated as often as the nature of the medicine will permit with safety, for eighteen or twenty-four hours, during which its full effect on the worms may be developed. This should be followed immediately by one pint of previously prepared infusion or mucilage of pumpkin seeds, drank at once. This will usually cause, in five or six hours, one or more free intestinal evacuations, carrying with them the entire worm. When evacuations do not follow in the time mentioned, a full dose of physic should be given to hasten the desired result. During the time occupied by the active treatment, the patient should take sparingly of liquid nourishment only.

This plan of treatment, when judiciously and faithfully executed, has succeeded in expelling the entire worm in three cases out of four. When it has failed, after allowing the patients a few days to recover from the debilitating effects of two or three days of fasting and evacuents, I repeat the same plan of treatment, and almost always with success. The variety of the worm having hook-shaped antennæ are the most difficult to expel. The only evidence of complete success is the finding of the head of the worm, which you distinguish from the other parts by its being a slight bulb or enlargement at the end of a long neck that had tapered almost to a point. Among these specimens, which I show you from the college museum, are some in which the head is readily distinguished. Concerning the best vermifuge or toxic agents to affect the different varieties of tape worm there is much difference of opinion expressed by writers and practitioners. I have succeeded best with the fluid extract of the pomegranate bark and the etherial extract of felix mas or male fern. I give the first in doses of four cubic centimeters (fl. ʒi) every three or four hours until five or six doses have been taken; and the second in half that quantity just as often, following them with the mucilage or infusion of pumpkin seeds. These doses are for adults, and each dose should be given diluted with a little sweetened water. In many cases I have given the pomegranate and male fern together, and occasionally have had the worm expelled before it was time to give the pumpkin seed tea. Besides the remedies I have mentioned you will find recommended in your books the flowers of the Brayera anthelmintica called kousso; the rottlera tinctoria, called kameela; carbolic and salicylic acids, and large doses of oil of turpentine or petroleum. Indeed, there are a great variety of remedies which have occasionally proved successful in expelling tape worms. The first tape worm I met with after entering upon the practice of medicine, was expelled while the patient, a young woman, was taking purgative doses of the powdered colchicum root. I must caution you, however, against resorting to excessive doses of drastic cathartics or of such oils as are liable to induce inflammation of the mucous membranes, either of the intestines or urinary organs. They are not only unnecessary, but liable to do much injury. Several cases have come under my care, in which oil of turpentine had been taken in from four to sixteen cubic centimeters (fl. ʒi to ʒiv) at a dose, resulting in tenesmas, excessive stranguary and bloody urine, from which the patients did not recover fully for several months, and yet without having expelled the worm.

With a proper attention to the preparation of the patient and the regulation of the diet, milder measures will be found not only safer, but uniformly successful in relieving the patient of his dreaded parasite.

As all this class of parasites are supposed to gain access to the alimentary canal in the form of larvæ or germs contained in pork and other varie-

ties of meat that has been taken for food, it suggests a prophylactic at once effectual, and within the reach of every family. It is simply to avoid all use of raw or inadequately cooked meats. And this leads me to say a few words about the *trichina spiralis.*

This parasite belongs to the group called nematoid, and first began to attract attention in the decade between 1820 and 1830. It is found most abundantly in the muscular structures of the hog, and, in a less degree however, in the flesh of almost all domestic animals. It gains access to the human system in the meat that is eaten, and is capable of multiplying rapidly and permeating from the intestines into nearly all the muscular structures of the body. When it exists only in small numbers, either in man or animals, it appears to exert very little influence upon the health. But when meat is eaten containing large numbers, it is apt to be followed first by all the symptoms of gastro-intestinal inflammation, such as vomiting, diarrhœa, severe griping pains, and rapid prostration. After a few days these symptoms abate, but are soon followed by severe pains and hyperæsthesia in one set of muscles after another until the patient is tortured with irregular pains and great soreness in almost all parts of the body and extremities, under which he may reach a fatal stage of exhaustion in from one to four weeks, or may slowly recover. A large proportion of the more severe attacks have terminated fatally in opposition to any form of treatment thus far devised.

Post mortem examinations have shown that the trichinæ exist in large numbers in various stages of development in most of the voluntary muscles of the body and extremities; and in cases which have terminated in death early, they are still found in the intestines.

Treatment.—After the trichinous disease has become fairly developed, no remedies have been found capable of exerting a satisfactorily controlling influence over its progress.

But few cases have come directly under my care, and consequently my opportunities for clinical observation in the treatment of the disease have been limited. In the first stage while the prominent symptoms are those of gastro-intestinal irritation, the following mixture has afforded more relief than anything else prescribed:

℞			
	Acidi Carbolici	0.500 grams	gr. viii
	Glycerinæ	30.000 c. c.	℥i
	Tincturæ Opii Camphoratæ	60.000 c. c.	℥ii
	Aquæ	30.000 c. c.	℥i

Mix. To adults four cubic centimeters (fl. ʒi) may be given every two or three hours until the vomiting and diarrhœa cease. After the gastro-intestinal symptoms abate, if the symptoms of pain and soreness in the muscles show that the parasites are developing in the muscular structures, I think it better to substitute from three to five decigrams (gr. v to viii) of salicylic acid in the place of the carbolic, leaving the other ingredients the same. If the patient survives the active stage and convalescence approaches, little else than rest and easily digestible food is required for completing the recovery.

Prophylaxis.—The only reliable mode of absolutely preventing the occasional occurrence of trichinosis is for all persons to avoid eating meat of every kind which has not been cooked or heated to 150° F., which renders it perfectly safe.

LECTURE XC.

Diabetes—Varieties, Clinical History, Prognosis and Treatment.

GENTLEMEN: Among the more important disorders connected with the functions of excretion, which have not been already passed in review, are the varieties of diabetes. This word signifies increased flow of urine, and clinically we meet with two varieties of the disease, one called diabetes insipidus, and the other diabetes mellitus. The prominent feature of the former is excessive flow of urine without material alteration of its constituents, while the latter, diabetes mellitus, is sometimes called glucosuria, from the fact that it not only presents a very great increased flow of urine in a given length of time, but the urine contains an abnormal amount of sugar. Both these forms of diabetes are met with more frequently during the early period of adult life than either in childhood or old age, although cases have been known to occur at all periods of life, even in infancy. Both varieties are said to occur much more frequently in males than in females.

Diabetes Insipidus.—The causes of this variety are very obscure, but facts seem to show that in a large proportion of cases exposure to cold, damp air, particularly living in damp rooms, with but little access of sunlight, directly favors the development of the disease. Drinking cold liquids when the body is warm or excited from severe exercise has been alleged as a cause in some cases, injuries affecting the brain or spinal cord, such as blows upon the head, shocks, and penetrating wounds, particularly when affecting the base of the brain or portions of the medulla oblongata, have been followed by this form of disease. While cases are on record of diabetes insipidus in which some one or more of the causes enumerated would appear to have exerted an important influence in their development, there are others in which it is difficult to trace any cause adequate for the production of the disease. It is probable that hereditary influence exists in some instances.

Symptoms.—Simple or insipid diabetes not infrequently commences abruptly, but in some instances its development appears to be slow and insidious. But whether abrupt or insidious, as soon as it has made sufficient progress to present a noticeable increase in the amount of urine passed in the twenty-four hours above normal, there is observed greater paleness of features, accompanied generally by an excited expression of countenance, some degree of mental despondency, frequently obscure, dull pains in the loins, occasionally aching in the lower extremities, although both these latter symptoms are not infrequently absent. The patients also tire easily, indeed, feel a sense of weariness a large part of the time, even when not undergoing muscular exercise. But the most prominent symptoms are the excessive quantity of urine passed, and the marked thirst or desire for drink. The latter, or desire for drink, increases at an almost uniform ratio with the increase in the flow of urine. After the disease has progressed for a few weeks, there is noticeable diminution of flesh, or emaciation, the skin becomes dry and rough, the mouth habitually dry, sometimes, on rising, giddiness or dizziness in the head, startings and restlessness in sleep at night, and, if the disease continues to progress, the patient becomes more and more emaciated, the skin dryer and more husky, the strength wastes till in some instances the exhaustion reaches a

fatal degree of progress. More frequently complications spring up in the latter stages of the disease, either in the form of diarrhœa, involving excessive discharges which speedily end in collapse and death, or in the development of local inflammation in the serous membranes, such as the pleura or pericardium, followed by copious effusion, and sometimes death. The disease is very persistent, nor is it amenable with certainty to any known mode of treatment.

Anatomical Changes.—It can not be said that post mortem examinations have revealed any structural changes which may be regarded as characteristic or peculiar to this form of disease. In some the kidneys have been found somewhat atrophied, in others they are enlarged and congested, in still other cases there has been found more or less fatty degeneration; and yet there are rare instances in which no morbid changes have been found, and instead of structural lesions in the kidneys, a few congested and altered appearances have been found in the ganglia of the sympathetic nerve. In a few cases morbid appearances have been seen in the liver; but as I have already remarked most of these changes have resulted from the influence of complications, rather than as a legitimate part of the diabetic affection. The essential pathology is certainly not well known. There are reasons to believe that the most constant pathological condition connected with the disease is dilatation of the capillary vessels of the kidneys, under some faulty influence of the vaso-motor nerves.

Prognosis.—The prognosis in this variety of diabetes must always be given with caution; for while a considerable proportion of those cases that are brought under treatment early, and the patients are in the middle period of life, recover, yet, where the early stage has been neglected, and in some instances even where treatment has been adopted from the beginning of the disease, the morbid action continues until the patient becomes fatally exhausted.

Treatment.—One of the important items in the management of all cases of diabetes insipidus, consists in a close examination of the history of the patient with a view of ascertaining as far as practicable the causes which may have had an influence in developing the disease, and to prevent their further action. The hygienic management is also of great importance. The patient should be required to wear warm flannel underclothes, occupy well lighted and warm rooms, with good ventilation and ample supply of pure air. He should take just so much exercise in the open air every day as his strength will allow; limit his drinks to a moderate quantity of milk whey, or buttermilk, and the class of mineral waters represented by those of Waukesha in Wisconsin, and which are found of a similar character in many parts of this country. It is not desirable or advantageous to punish the patient by actual deprivation of drinks, but the quantity should be limited as much as the patient can bear without too much discomfort. Many of the cases are accompanied by a rather voracious appetite. If so, some degree of restriction should be placed, sufficient at least to limit the quantity to the capacity of the stomach, to digest fully; otherwise the patient's condition will be aggravated by indigestion and the fermentation of the excessive quantities of food in the stomach. Such gastric disorders disturb still more the nervous centers, and radiate an increasingly disturbing influence upon the vaso-motor nerves and thereby increase the diabetic difficulty. A great variety of remedies have been tried in this form of diabetes, but very few of them have been found capable of producing permanent benefit. Nitrate of potassium, iodide of potassium, and the carbonated alkalies have been given sometimes with apparent advantage, but usually without exerting any material influence.

Almost every variety of astringent, vegetable and otherwise, such as tannin, gallic acid, alum and preparations of iron, have been given with a view of exerting a tonic or astringent influence upon the capillary vessels of the kidneys, and thereby lessen the flow of urine. So far as my own observations go I have seen but little benefit from the use of any of these remedies. Within the last few years some cases of a very well-marked character have been under my care, in which the patients derived decided advantage from the use of a reliable preparation of ergot, either in the form of ergotin or the fluid extract. Two of the cases to which I allude were placed upon the use of ergot and glycerine combined, two parts of the glycerine and one of the fluid extract of ergot, of which the patient, who had arrived at adult life, was given, at first, two cubic centimeters (fl. ʒss), but which was gradually increased to four (fl. ʒi) at a dose, four times in the twenty-four hours. Each dose of the medicine was given largely diluted with water. Two or three times during the treatment of these cases sufficient doses of pilocarpine were given to produce the characteristic flow of saliva and diaphoresis. In one of them moderate doses of codeine were given every night, partly for procuring rest, and partly for its effect in lessening the urinary secretion. Under the same treatment, continued in the one case three months, and in the other two, recovery took place, each for a considerable length of time continuing without a relapse. After several months both patients passed beyond my observation, consequently I have not learned whether subsequent relapses took place or not. In two other cases similar measures produced amelioration of the symptoms, and rendered the patients very much more comfortable for a long period of time, and yet, ultimately, failed to control the disease. Where the skin is very dry, as is true in most of the cases, a warm bath twice a week followed by light, rapid frictions of flannel over the whole surface, is well calculated to aid in ameliorating the condition of the patient. In some cases, also, the moderate influence daily of electricity or galvanism, applied with the positive pole upon the back of the neck or below the occiput, and the negative alternately over the loins and over the epigastrium, has been found to aid in diminishing the prominent symptoms of the disease.

Diabetes Mellitus.—Perhaps more frequent than the insipid variety, and decidedly of greater importance because more persistently tending to the destruction of the patient, is that form of diabetes in which the increased flow of urine is accompanied by constant, or nearly constant, excess of glycogen, or sugar. There are two classes of patients subject to attacks of this variety of diabetes: The one class are naturally of spare form and rather nervous temperament; the other, decidedly obese from an excess of fatty nutrition. So far as my own observation has gone, nearly all the cases of the latter variety have been females. I have seen but two instances in which diabetes mellitus existed in males presenting a decided predominance of fatty nutrition or obesity; while three or four times that number of females are still fresh in my recollection. But whatever may be the temperament of the patient, this form of diabetes almost always commences slowly and very obscurely. The first symptoms which usually attract the attention of the patient, or his friends, are an unusual feeling of weariness and consequent indisposition to exertion, together with an inordinate desire for drink, and in some cases, also, an unusual appetite for food. And though taking with a relish, perhaps an excess of both food and drinks, yet he finds his strength from day to day diminishing, with increased weariness, aching in the limbs, and sometimes in the loins. In a few weeks after the symptoms are first observable, there will usually be more or less derangement of digestion, the patient by his appetite

being induced to take more food than there is gastric juice to impregnate or prevent from fermenting, the period of digestion becomes disturbed by the formation of gaseous eructations, in some cases tasteless, in others strongly acid. The bowels are apt also at this period to be more or less constipated. These symptoms almost always induce patients to think that they are either bilious or dyspeptic, and consequently they resort to remedies of their own, choosing usually some form of physic, but which does not afford them any of the relief they had anticipated. Usually in from one to three months from the first beginning of symptoms they will have reached a degree of weakness, thirst, unusual appetite, loss of flesh, dryness and huskiness of the skin, dryness of the mouth, which impresses upon them the conviction that it is time to seek medical aid. It is in this condition that a large majority will first present themselves to their physician. When they come to you under such circumstances, you will find them with a pulse soft, weak, easily compressed, but little or not at all increased in frequency; extremities rather cold and having a congested look, from the slowness of the circulation in the cutaneous capillaries; the voice rather weak, lips looking dry, and countenance often pinched, from more or less shrinking or emaciation. They will complain of weakness, despondency, some degree of indigestion, having constipation the greater part of the time, but occasionally alternated with short turns of diarrhœa or looseness of the bowels. Many also present a slight dry cough and a very dry corrugated and husky feeling of the skin.

Such symptoms should always cause you to suspect the existence of diabetes. In order to render the examination of the patient complete, it is not only necessary to ascertain from him that he is making a larger quantity of urine than natural every day, as well as drinking more largely, but a specimen of the urine should be obtained for direct analytical examination. If a specimen of urine is subjected to proper tests, it will be found of high specific gravity, usually varying from 1020 to 1040, a little paler in color than natural, having a very slightly turbid appearance, although in many cases it remains as clear as spring water. The most common test, or that which is sufficient for clinical purposes, is known as Trommer's test, or the modification of it proposed by Fehling. This test consists essentially in first placing in a test tube equal quantities of a solution of sulphate of copper and of caustic potassæ, then adding a few drops of the suspected urine and heating it over a spirit lamp until it boils. The reaction between the liquor potassæ and the copper are such if sugar is present as to cause a precipitate of the insoluble suboxide of copper of an orange or brick red color. Fehling's test consists in a ready formed solution containing a proper proportion of the copper and potassæ; and by placing a small quantity of this in a test tube, and adding directly to it a few drops of the suspected urine, and then bringing it to a boiling heat over the spirit lamp the copper is reduced and the characteristic orange red precipitate is formed in the solution. This is a very convenient test because it can be quickly applied, but the liquor is liable to change after long standing, and consequently should be prepared fresh at short intervals of time. The amount of sugar in the urine will be indicated by the quantity of precipitate formed. To judge of the quantity of the sugar excreted it is necessary to take into account both the ratio of precipitate that is formed in a given quantity of urine in the test glass, and the actual absolute quantity of urine passed in the twenty-four hours. And as many patients with diabetes mellitus, after the disease is well established, pass from one to three or four gallons of urine in the twenty-four hours, it can be readily seen by the indications

of sugar in the test tube, that the quantity passed in the amount of water named would be sufficient to require the appropriation of nearly all the food the patient could take instead of allowing any to remain for the proper nutrition of the tissues of the body. It is in consequence of this drain that most diabetic patients rapidly emaciate until their tissues are as attenuated as in the advanced stage of the slow wasting form of tubercular phthisis. When the extreme stage of exhaustion has been reached there are some instances in which the feet and ankles become swollen or oedematous, but more frequently they become blue, cold, shrunken and sometimes are attacked with gangrene. More generally, however, before such results are reached the frequent turns of diarrhœa, and the imperfect nutrition of the mucous membrane of the alimentary canal lead to collapse and death from pure inanition. But a large proportion of the cases of diabetes mellitus are also complicated with tuberculosis, and as they reach the extreme degree of exhaustion, the tubercular deposit in the lungs begins to develop active characteristic changes, and cause expectoration and all the phenomena of consumption, thereby hastening the final termination of the case.

The clinical history I have now given you applies more especially to that class of diabetic patients who are not obese or subject to excessive fatty nutrition. In this latter class of cases there are usually certain important modifications in the progress of the disease. There is the same thirst, the same excessive flow of urine usually with quite as large a proportion of saccharine matter in the urine when voided, but these cases differ chiefly in the fact that their tissues emaciate but slowly, retaining a decided fullness from fatty deposit and a look of obesity to a very late stage of the disease. As they arrive at an advanced period in its progress there is almost always the occurrence of a most troublesome and sometimes remarkable development of boils, abscesses and carbuncles that may make their appearance in any part of the cutaneous surface and sometimes occupy almost the entire surface of the body. Two or three years since, one of the most striking cases of this class came under my observation in the west division of the city. It was a woman about forty-five years of age, who had during the earlier part of life enjoyed apparently good health and was the mother of a large family of children. She had acquired a strongly marked fatty accumulation, sufficient to give her a weight of nearly two hundred pounds. She was attacked with diabetes mellitus, and as far as I could learn it had come on in the usual way, insidiously, and had been continuing at least six or seven months at the time I was called in consultation in the case. She presented the most striking picture of a human being covered with boils, abscesses and carbuncles (the latter varying in size from half an inch to three inches in diameter), that I have ever seen since I have been engaged in the practice of medicine. These larger carbuncles were distributed over the whole posterior part of the body, from the neck down to the gluteal regions, while the anterior part of the trunk and more or less of the extremities were covered with hard, prominent, slowly suppurating boils, with half a dozen or more cellular abscesses in different parts of the body. This poor woman lingered two months more in great misery from these sores when she was relieved by arriving at the fatal stage of exhaustion. Throughout the whole course of the disease the urine was strongly impregnated with saccharine matter, and the quantity voided was usually from three to six quarts in the twenty-four hours. I have seen no cases of this class recover. Two that I have had under treatment, temporarily convalesced, and remained apparently nearly free from any excess in the quantity of urine or appearance of saccharine

matter for several weeks at a time, when both would return, but under treatment would again be checked, and one of them, after its being kept in abeyance a considerable time, finally took on persistent or continuous symptoms, and terminated fatally; the other is still under treatment and has presented well-marked diabetic quantities of urine with sugar in it, accompanied by the same degree of thirst and moderate dryness of the skin for three or four weeks at a time and then disappearing under a certain amount of treatment, and remaining absent from two to four months at a time. Although this patient has lost from her previously full, fatty habit, at least thirty or forty pounds in weight, she is still by no means emaciated, but would give to any observer the idea of a moderate degree of obesity. What will be the ultimate result remains to be seen.

Pathological Changes.—The same remark may be made in regard to the anatomical changes found after death from diabetes mellitus as was made in reference to that of diabetes insipidus. In more than half of all the cases the patients are found to have more or less of tubercular deposit, sometimes in an entirely crude, primary condition, disseminated through the various structures, particularly in the lungs, but in some cases in the liver, spleen and kidneys, and at other times more advanced. Yet in many other cases no traces of tuberculosis can be found after death. Consequently it must be admitted that although there is some evident affinity or close relationship between diabetes mellitus and tuberculosis, they are not necessarily associated, or the one dependent upon the other, but that they frequently exist as coincident affections. The kidneys are found on post mortem examination in many instances moderately enlarged, softened or flabby in texture, in some instances paler than natural, in others having the appearance of congestion or hyperæmia. But there are no constant anatomical changes observable in these nor any other organs in the body. The liver in some cases presents a congested and enlarged condition; in other instances, if there is any change, it is contracted and apparently less vascular than natural. Examination of the ganglia of the sympathetic and vaso-motor systems of nerves has revealed, in some instances, a congested or apparently inflammatory condition of the ganglia, especially those along the trunks of that part of the nerves contained in the thorax and abdomen. Quite as often, perhaps, some obscure indications of disease have been observed in the medulla and base of the brain. It is a well-known fact that wounds inflicted, especially penetrating wounds, into the floor of the fourth ventricle, and in some portion of the base of the brain and medulla, sometimes produce all the phenomena of diabetes mellitus, increasing the flow of urine, and producing a copious amount of saccharine matter in it. Injuries of the brain from concussion and injuries to the spinal cord, have not infrequently resulted in the production of diabetes, or at least saccharine urine. It is quite evident from the absence of any uniform morbid condition of the kidneys, that we must look elsewhere than in these organs for the essential pathology of the disease. And since it has been well ascertained that the starchy and other carbonaceous constituents of the food are converted into glucose or sugar, in the further changes constituting assimilation or the passage from mere crude material as taken into the stomach to the constituents of blood, and still further, that these changes take place largely in the liver, many experiments have been performed on animals with a view of determining with some degree of certainty the function of the liver, so far as it relates to the conversion of the materials derived from the digestive organs into sugar. And although those performed by Bernard and by A. Flint, Jr., and a number of

others, seem to show conclusively, or with a reasonable degree of certainty, that sugar was a product of the changes which take place in the liver, still Pavy and others have claimed with almost an equal degree of plausibility that the production of the sugar found in the liver was the result of the post mortem changes taking place speedily after the cessation of life, and not a natural product from the processes that had taken place in the healthy living organization from day to day. Without attempting, however, to decide this controversy, I think I am justified in assuming that a large proportion of the carbonaceous and especially the starchy constituents of food are naturally converted into sugar during the processes of digestion and assimilation. Whether this change is confined altogether to that part of the material that passes through the liver, and the transformation which takes place in the texture of that organ is part of its natural function, or whether the same general change is taking place more or less in all the glandular structures through which crude material passes from the stomach and duodenum on its way to reach the blood, is perhaps not clearly determined. But that such a change does take place there is, at least, reasonably satisfactory evidence, derived alike from experiments, clinical observations, and the chemical analysis of various secretions. It is highly probable that the first link in the chain of morbid action, or the essential pathology of diabetes, consists in the arrest of the assimilative process at the stage when sugar is developed; the natural, complete process consisting in a further change by which the sugar is converted into lactic acid and other constituents. But in the diabetic patient this further change does not result, and the product, as sugar, passes into the blood, filling that fluid with an excess of this material, the presence of which stimulates the kidneys to increased activity, by which it is eliminated with a greatly increased quantity of urine. The enormous flow of urine, carrying with it the watery element of the blood, drains the tissues and creates the thirst. The gratification of this thirst for repleting the watery element of the blood, keeps up the material from that source, and perpetuates the ability of the patient to pass large quantities of urine. This view of the pathology of the disease is corroborated by the effects of regulating the diet. For, though the disease is not cured by such regulation of diet, yet whenever all those articles of food are excluded from use which are capable of being converted by the assimilative processes into sugar, the quantity of urine and the amount of sugar excreted are both greatly reduced; so much so indeed as to show conclusively that there is a direct and persistent connection between the quantity of sugar evolved in the system and the amount of food the patient takes capable of undergoing such evolution.

LECTURE XCI.

Diabetes Mellitus Continued—Diagnosis, Prognosis and Treatment—Enuresis.

GENTLEMEN: *Diagnosis.*—Diabetes is not likely, after it is fairly established, to be confounded with any other disease except diabetes insipidus. From this it is distinguished by the chemical tests which determine the presence or absence of sugar in the urine, and as these tests

have already been spoken of, and the characteristic symptoms fully pointed out while giving the clinical history of the disease, they need not be repeated under this head.

Prognosis.—It must be said that the prognosis in well formed diabetes mellitus is unfavorable; for though some cases have recovered under persistent hygienic and medical treatment, very much the larger number have persisted until a fatal termination has been reached.

Treatment.—As you might infer from the suggestions concerning the essential pathology of the disease, the important part of the treatment in all cases of diabetes consists in the hygienic regulations to which the patient must be subjected. It is of great importance that the patients be supplied with pure air, rooms of comfortable temperature, clothing of such quality as will best secure the surface against sudden and severe atmospheric changes, of which flannel next to the surface is perhaps the best; daily, moderate out-door exercise so long as the strength will permit, but without excess either of mental or physical exertion; a warm bath at least twice a week, followed by frictions of flannel to increase the activity of the circulation in the surface as much as possible, and to keep up the cutaneous eliminations which are liable to become very limited and the skin very dry. The diet should be so regulated as to allow the least amount of carbonaceous, and especially starchy products of food that will be consistent with the continuance of digestion and assimilation. It is desirable to exclude totally the use of potatoes, turnips, beets, carrots and corn bread, and to some extent also the ordinary wheat and rye flour breads. Patients should be limited to the coarser brown breads, or still better to bread made of bran; to the free use of meat of any variety that they may choose, but especially good fresh lean meats, and for vegetables the celery, cabbage, onions, lettuce and spinach may be used with freedom. The patient may drink freely of milk whey, skimmed milk, and of buttermilk, but should use rather sparingly sweet milk containing the caseine naturally belonging to it. He can drink freely of certain mineral waters, of which the Bethesda spring water of Waukesha, Wisconsin, is a good representation. Eggs and butter, as well as some kinds of fruit, especially those containing but little saccharine matter, may be allowed moderately. The moderate use of tea and coffee may also be allowed. Whenever the disease is taken under care early, and the diet is rigidly regulated on the principles I have just indicated, eliminating or excluding all those articles that contain any considerable proportion of starch, gum or sugar, or other ingredients capable of being converted into sugar, but allowing a sufficient variety of the nitrogenous and other ingredients I have enumerated to maintain healthy nutrition, such a course will greatly ameliorate the condition of the patient and retard the progress of the disease, without any medication whatever; particularly, if it be accompanied by thorough warm bathing and frictions upon the surface two or three times a week. But there are some medicines in which I have acquired considerable confidence as calculated to add much to the efficiency of the proper regulation of the diet and habits of the patient. After trying almost every remedy and combination of remedies that has been proposed in the last forty years I am sure that none of them can be relied upon as specifics for the cure of this disease. I have derived the greatest amount of benefit and in some instances have seen the disease entirely arrested, at least for a time, by giving careful attention to the regulation of the bowels, obviating constipation, keeping the secretory functions, especially those concerned in excretion, as regular and healthful as possible, using such means as the condition of each individual patient may

indicate. Whenever the tongue is coated, the patient feverish, and the bowels inclined to be costive, I have uniformly found advantage from giving three or four alterative doses of the mild chloride of mercury and following them by a laxative sufficient to procure a moderately free movement of the bowels. After paying due attention to the regulation of the secretory functions, and the removal of coincident functional disturbances as far as they may belong to individual cases, the medicines which have seemed to have most direct influence in controlling the disease have been moderately large doses of glycerine, acidulated with citric acid, taken in a very dilute form, usually about an hour after each meal, and a full dose of ergotine with codeine at bed time. I usually direct patients to commence the use of glycerine acidulated with citric acid in doses of two cubic centimeters (fl. 3ss) in an ordinary tumbler one third full of water, gradually increasing the doses of glycerine until, in the course of two weeks, they reach four cubic centimeters or an ordinary teaspoonful. You must be sure that the glycerine is taken well diluted with water. In many instances I have directed, at the same time, a pill of two decigrams (gr. iii) of ergotine after breakfast and at bed time, adding to the dose at bed time from one to two centigrammes (gr. $\frac{1}{4}$ to $\frac{1}{3}$) of codeine. Before I commenced the use of ergotine and codeine I had given a considerable number of diabetic patients every night a pill containing from six to nine centigrammes (gr. i to iss) of opium with the one centigramme (gr. 1-6) of sulphate of copper in addition to the medicine they were taking during the day, and with a decided beneficial influence. In a very strongly marked case of diabetes, in a man aged about thirty years, who was employed in one of the railroad depots of the city, after taking glycerine acidulated with citric acid as I have indicated, apparently with a moderate degree of benefit during the first two weeks of treatment, and when he had reached the dose of four cubic centimeters three times a day, the remedies seemed to induce an attack of vomiting and diarrhœa almost as severe as an ordinary attack of cholera morbus. The discharges were at first thin and copious, but in the course of twenty-four or thirty-six hours, became more painful, small in quantity, and mingled with mucus and a little blood, much resembling dysenteric evacuations. The glycerine was immediately discontinued, but it required eight or ten days for the patient to recover from the severe irritation that had supervened in the mucous membrane of the alimentary canal. During all this severe irritation in the alimentary canal, the excretion of urine was but little more than natural in amount, and afforded very little evidence of the presence of sugar. As the patient recovered from his intestinal difficulty, he found that the quantity of urine began again to increase, with a correspondingly increased proportion of sugar. He was again put upon the use of the glycerine, being more cautious to have it largely diluted when taken and the dose a little smaller than had been the case before. Irritation of the bowels was also repressed by a moderate opiate at night. The disease was again checked without any untoward symptoms, and in about three months he apparently recovered good health, and returned to his ordinary occupation. Twice after that there were symptoms of relapse, and the same treatment resorted to again restored him, after which he remained apparently free from the disease and pursued his occupation almost uninterruptedly for a period of nearly ten years. During the greater part of that time he used but little of the more starchy vegetables. He adopted as his permanent diet what might be called a meat diet, with very little use of the tuberous roots, such as beets, turnips and potatoes, but otherwise indulged in nearly the ordinary diet provided upon the family table. I

have obtained the same result, without the intercurrent period of irritation of the bowels, in at least six or eight cases of well marked diabetes mellitus. But this is a small number compared to the whole number of cases that have come under my observation, and consequently demonstrates but a small ratio of cures. I have also treated a number of patients on the principle of aiding in the assimilative processes more especially, and consequently have made diligent and protracted use of the various preparations of pepsin, lactic acid and the lactates, peroxide of hydrogen, antacids and carminatives, but in very few instances with any perceptible influence over the progress of the disease. The only preparation of pepsin, or the class of agents addressed directly to the supposed improvement of digestion and assimilation, which has been in a marked degree beneficial in my hands is a preparation of rennet, made by macerating a good specimen of rennet, preferably from the pig, in dilute acetic acid or vinegar, thereby making a dilute acetated tincture of the rennet. It may be prepared extempore by cutting up fresh rennet and putting it into the vinegar, allowing it to stand two or three days, occasionally shaking or stirring it up. The patient can take of this preparation doses of four cubic centimeters (fl. ʒi) just after each meal, gradually increasing it till from eight to twelve cubic centimeters (fl. ʒii to ʒiii) are taken at a dose. This mode of treatment was first proposed, so far as my knowledge extends, by Dr. Joseph Jones, now of New Orleans, who at the time of proposing this treatment was practicing in Georgia, and in connection with a medical school in that State. He reported the successful treatment of several cases of the disease with the rennet prepared in extempore as I have already suggested. I found it to diminish the amount of urine secreted and to palliate some of the more distressing symptoms of the patient in the advanced stages of the disease, but its influence appeared to be purely palliative or temporary, having no curative effect. Another remedy which has been recommended, and which, in the early stage of the disease, may be resorted to once or twice a week perhaps with advantage, is the pilocarpine or the fluid extract of jaborandi. Whatever preparation is used should be in such doses as to produce the specific effect of the drug in a moderate degree without carrying it far enough to produce too great a degree of depression. Creating a moderate flow of saliva and sufficient diaphoresis to moisten the skin for a time and repeat this in connection with other treatment once or twice a week has been found to exert a favorable modifying influence over the progress of the disease. As the patient's strength fails, and he becomes tormented day and night with inordinate thirst, and yet so weak and tired as to make life a burden, and it has become apparent that the disease has passed beyond any reasonable expectation of control, remedies should be given more with a view of palliating the patient's symptoms, and ameliorating his suffering than for any other purpose. He should then be allowed a liberal quantity of drink, persuading him to use, a part of the time at least, milk whey and buttermilk rather than exclusively water, and giving him some one of the preparations of opium, of which perhaps codeine is the best so long as it can be made to answer the purpose. For the purpose of allaying restlessness, lessening consciousness of suffering, and especially to procure some degree of sleep at night, opiates in some form become indispensable in the advanced stage of the disease. This form of diabetes, as well as that of diabetes insipidus, has been treated with electricity, galvanism and electro-magnetism, in almost all modes of application

and degrees of perseverance, but with very little apparent influence over the progress of the disease.*

Enuresis.—By enuresis I mean incontinence of urine, which, although having no connection with or analogy to diabetes in any form, is, nevertheless, a very troublesome affection, particularly apt to be met with in children under ten years of age. Some cases are met with at a later period of youth, or up even to adult life. The affection to which I more particularly allude is not absolute incontinence, or constant dribbling of urine, for most of the patients during the day will be able, by passing their urine frequently, to avoid actual dribbling, or wetting their clothes. Many of them, however, especially when under ten years of age, are not sufficiently vigilant, and often while at play, either in doors or out, will allow more or less urine to escape, and cause some soiling of their clothing almost every day. But the chief trouble with this class of patients comes at night. A majority of them, after the utmost pains are taken to have them fully empty the bladder on going to bed, will soon fall asleep and remain so from one to four hours, when the urine passes involuntarily while they are profoundly asleep, thereby wetting the bed and everything around them. This will be renewed in many cases two or three times in the course of every night, rendering themselves and the bed very untidy, and giving a great annoyance to mothers and nurses. Of course there are different degrees of frequency of urination in this class of cases during the night as well as day. In some instances it will occur but once, and occasionally one or two nights will escape. In others, as already remarked, the bed will be saturated three or four times between the ordinary hours of retiring at night and rising in the morning. It is a very common occurrence for parents to be annoyed with this circumstance, and to treat the child as though it was a matter the child could control. And not infrequently chastisements have been inflicted upon the unfortunate children, with a view of teaching them better manners than to be wetting the bed every night. But I have never known an instance in which chastisements succeeded in effecting a cure, but many in which they aggravated the difficulty. The more timid patients become, and the more their minds are subject to dread or fear the less control the nerves have over the sphincter muscles of the bladder. Consequently all such harsh and cruel treatment of these children should be avoided. It is the duty of the physician to give heed to these cases whenever parents call their attention to them; and instead of treating it as a matter of course, or a habit, careful inquiry should be made into the circumstances that operate upon the patients, their mode of eating and drinking, the condition of their digestive organs, and especially the condition of the nervous system, for the purpose of ascertaining the causes on which the difficulty depends. With many of them it will be found that it is mainly associated with imperfect digestion of food and habit of drinking water indiscriminately a dozen times in the day, and frequently up to the time of retiring to bed. The blood is thus supplied with an undue proportion of its watery element, and the urinary secretion increased. In other instances, and perhaps in the greater

*At the recent meeting of the American Medical Association in Washington, an interesting paper on "The Milk Treatment of Disease" was read in the Section on Practice of Medicine and Materia Medica, by Dr James Tyson, of Philadelphia, in which he uses the following language: "As to diabetes mellitus, it is now generally conceded that no measures are so efficient in removing the sugar from the urine, and relieving other symptoms, as the dietetic; and of the dietetic treatment none has been so promptly efficient in my hands as an exclusive milk diet." He prefers skimmed milk, and requires adult patients to take from 130 to 390 cubic centimeters (fl. oz. iv to oz. xii) every two or three hours. Very recently several cases of diabetes mellitus have been reported in the medical periodicals as successfully treated with bromide of arsenic. In a paper on this disease read in the Medical Section of the American Medical Association at its recent meeting, by Dr. Austin Flint, Jr., the bromide of arsenic is referred to as beneficial in many cases. He gives the remedy in doses of three to five minims three or four times a day, largely diluted with water.

number, the difficulty will be found to consist in a morbid condition of the nervous system, more especially with the excito-motor or reflex system, which governs the sphincters of the body. It will be found that, while most of these patients are of a nervous temperament, excitable and easily frightened, there is less than the natural amount of involuntary action in the sphincter muscles, and there is also more or less of imperfect digestion of food, causing the gastric secretion to be unduly acid and the urine more stimulating to the coats of the bladder, and disturbing to the whole nervous system.

Very many of this class of patients, especially those in early childhood, are paler than natural, showing a decided predominance of the watery element of the blood, and deficiency of the red corpuscles, together with a markedly excitable nervous temperament. Nearly all of these cases can be cured if the physician will go earnestly about ascertaining the temperament, habits and influences which may be operative in producing and perpetuating the malady, and adjusting the rational remedies for their correction. It is desirable to select such remedies for steady, regular use from day to day as are calculated to diminish the morbid excitability of the coats of the bladder, and to improve directly the tone and efficiency of the excito-motory nervous system. In other words, the remedies should embrace a nerve tonic in connection with something that will diminish the sensitiveness of the mucous membrane lining the bladder and urinary passages. In some of the slighter cases accompanied by derangement of the digestive organs, nothing more is required than to have a watchfulness kept over the amount of drink that the patient takes in the latter part of the day and evening, the avoidance of indigestible food, and the regular administration of some one of the alkaline carbonates sufficient to neutralize any excess of acid in the stomach and the secretions, thereby rendering the urine more free from irritating qualities. Where the habit is more fixed and the child has become more pale, or anæmic, I have derived much benefit from the use of preparations of iron as tonics, and moderate doses, in some instances, of ergotine, and in others, of strychnia or nux vomica, as remedies designed to directly increase the tone of the nervous system. I have frequently prescribed a mixture of glycerine and syrup of the iodide of iron in the proportion of three parts of the first to one of the last; of which mixture from ten to twenty minims may be given three times a day, largely diluted with water, to children from five to seven years of age. With the evening dose I have often added five minims of a good fluid extract of ergot with advantage. But whatever may be the remedies adopted, if they are adjusted in suitable doses and are calculated to lessen the sensitiveness of the urinary organs, and the irritating quality of the urine, whenever it may contain an excess of uric acid or uric acid salts, and at the same time to exert a tonic and invigorating influence upon the general tone of the organic nervous system, there will seldom be a failure to remove this annoying difficulty within a few weeks. Recently the following formula has been used in a considerable number of cases with unusual success:

Extracti Rhus Aromat. Fluidi	45	c. c.	℥iss.
Extracti Ergot Fluidi	30	c. c.	℥i.
Tincturæ Nucis Vomicæ	15	c. c.	℥iv.
Simple Elixir	60	c. c.	℥ii.

Mix. Give to a child five years of age from ten to fifteen minims three times a day, in a little sweetened water. In all cases due attention should be given to the supply of good food, pure air, proper clothing and out-door exercise.

LECTURE XCII.

Alcoholic Liquids as Therapeutic Agents: What indications are they actually capable of fulfilling in the treatment of disease? And what substitutes, if any, can be employed by the physician with advantage to his patients?

GENTLEMEN: I take pleasure in complying with your request to occupy the hour that remains for completing the present course of lectures, in the presentation of my views concerning the therapeutic value of alcoholic liquids in the practice of medicine.*

Alcoholic liquids, as derived from the fermentation of various fruits and vegetable substances, have been known and used from an early period in the history of our race. Being derived from the grape or fruit of the vine chiefly, the name vinum, or wine, was naturally applied to all these liquids, until some time in the seventh century, when a liquid obtained from the fermentation of corn began to be called beer by the Saxons.

During the prevalence of the Alchemists' or Arabian school of chemistry, in the eleventh century, the vinous liquids in use began to be subjected to distillation, by which the active intoxicating constituent was obtained in a concentrated form, to which was applied the name "spirit of wine," and afterward the word "alcohol." This last word appears to have been first used by the Arabians to designate an impalpable cosmetic powder used by the women of that day. It was afterward applied to various subtle powders, and finally to spirit of wine. The first really scientific use of the term "alcohol" with which we are acquainted was by Lemert in his chemistry, published in 1698. For a long period after the discovery of spirit of wine or alcohol, it was used only as a solvent or menstruum in the preparation and preservation of other substances, while the fermented liquids continued to be used as drinks. The impure and diluted alcohols derived from distillation of fermented liquids, known as brandy, gin, rum and whisky, are of modern origin, having been introduced into use within the last two or three centuries. Although we have a large variety of beverages derived from fermentation and distillation, known as wines, beers and distilled spirits, yet ethylic, or absolute ether, universally known under the name of alcohol, constitutes the active, controlling ingredient in them all. The amount of this alcohol in the fermented drinks, called wines, beers, ales, etc., varies from four to twenty per cent., while in the distilled spirits, called brandy, whisky, rum and gin, it constitutes from fifty to seventy-five per cent. Separate the alcohol from all these liquids, and the remainder would be capable of producing very little more effect on the human system than pure water. The juniper in gin, the hop in beer, and the vegetable acids and fecula in wines, are in quantities too small to exert any important influence, and hence may be omitted from our further consideration.

When we speak of alcohol, therefore, or of the effects of alcohol, throughout the remainder of this paper, we mean to include all alcoholic liquids, whether fermented or distilled. Until analytical and organic chemistry had made sufficient progress to show the composition of the more common articles of food and drink, no efforts were made to explain the special or physiological action of alcohol on the human system. All liquids containing it were simply regarded as cordial or stimulant, and capable of supporting strength and life. When the chemico-physiolog-

*This was the closing lecture in the Practitioners' Course for 1884, and was given in compliance with a special request of the class in attendance.

ical school of investigators, with Baron Liebig at its head, developed the fact that all alimentary substances were capable of being arranged into two classes, the nitrogenous and carbonaceous, they very naturally adopted the theoretical idea that the former, when taken into the system, were appropriated to the nourishment of the tissues, while the latter united with oxygen by a species of combustion, resulting in the development of animal heat and carbonic acid gas, and hence were familiarly styled "respiratory food."

Alcohol, being one of the purest of the carbonaceous class, and especially rich in carbon and hydrogen, was at once assigned a place at the head of the list of respiratory foods, and of supporters of animal heat. When taken into the living system it was supposed to unite rapidly with the oxygen received through the lungs, evolving heat, and leaving as resultants carbonic acid gas and water; in this way its supposed heating and stimulating effects were explained.

The simplicity of the explanation, coupled with the high authority of Liebig, caused it to be almost universally accepted, although resting on a purely theoretical basis, without a single experimental fact for its support. It was not long, however, before Dr. Prout, of London, ascertained, by direct experiment, that the presence of alcohol in the human system directly diminished the amount of carbonic acid gas exhaled from the lungs, and consequently there could be no combustion or oxydation of the alcohol by which it was converted into carbonic acid and water. Dr. Percy* and others, by examination, found that alcohol taken in a dilute form into the stomach, was taken up without change of composition, and carried with the blood into all the organs and structures of the body, and that its presence could be easily detected by the proper chemical tests. The chemico-physiologists, however, still assuming that alcohol, being a hydrocarbon, must necessarily be used for maintaining temperature and respiration, suggested that the union of its elements with oxygen might be such as to result in forming acetic acid or aldehyde instead of carbonic acid gas. Hence they still sustained the popular belief that alcoholic drinks were capable of increasing both the temperature and strength of the human body. In the mean time, the process of experimentation went on. Dr. Böcker,† of Germany, by a well-devised and carefully executed series of experiments, proved that the presence of alcohol in the living system, actually diminished the sum total of eliminations of effete matter daily; and consequently, that its presence must retard those molecular changes by which nutrition, secretion and elimination are effected. In 1850, the writer of this paper prosecuted an extensive series of experiments to determine the effects of different articles of food and drink on the temperature of the body, and on the amount of carbonic acid excreted from the lungs. These experiments proved conclusively that, during the active period of digestion after taking any ordinary food, whether nitrogenous or carbonaceous, the temperature of the body is always increased; but after taking alcohol in the form of either fermented or distilled drinks, the temperature begins to fall within half an hour, and continues to decrease for from two to three hours. The extent and duration of the reduction of temperature was in direct proportion to the amount of alcohol taken, provided the effect was not complicated by the coincident ingestion of digestible food. The results of this series of experiments were embodied in a paper read to the American Medical Association in May, 1851.‡ A few

* An Experimental Inquiry Concerning the Presence of Alcohol in the Ventricles of the Brain, etc.; London, 1839.

† Beitrage zur Heilkunde, Crefeld, 1849.

‡ See Northwestern Medical and Surgical Journal for 1851.

years later, the experimental researches of Lallemand, Perrin and Duroy,* proved conclusively that alcohol, when taken into the stomach, was not only absorbed and carried with the blood into all the organs and tissues of the body, but also that it was eliminated as alcohol, unchanged chemically, from the lungs, skin and kidneys. The experiments of Prout were repeated, and his results confirmed by Sandras and Bouchardet, of France, W. A. Hammond,† myself and others of this country. Those of Böcker were carefully repeated and varied by Anstie, of England, and Hammond, of this country. My own in reference to the effects of alcohol on animal heat have been repeated, and the results confirmed by a large number of observers, among whom are Drs. Richardson,‡ Anstie and Hammond. Those of Lallemand, in reference to the elimination of alcohol, have been equally confirmed, except the claim that the amount eliminated is not equal to the whole quantity taken.

It is conceded by all investigators that when alcoholic liquids are taken into the stomach or in any other way administered, the alcohol is rapidly absorbed into the blood, circulates with it throughout all the tissues of the body, and may be detected in the form of alcohol, both in the blood and in the structures of the various organs. All agree, also, that it is eliminated through the various eliminating structures, as the skin, lungs, kidneys, etc. These simple facts, when observed in regard to the behavior of any other substance, are regarded as amply sufficient to prove that the substance so acting is not alimentary in its nature, but foreign to the system.

But so strong is the predisposition to find some important use for alcohol in the human system, caused by customs and habits of thought through many generations, that the most vigorous tests and calculations have been made to ascertain whether some part, at least, of the alcohol taken might not be retained, and if not used directly for nutrition of the tissues, certainly converted into some kind of force or energy. The late Dr. Anstie, who followed up the investigation of this question with the most commendable perseverance, came to the conclusion that an average sized adult in ordinary health was capable of retaining about 45 grammes (fl. ℥iss) of pure alcohol in the twenty-four hours, admitting that whenever more than this was taken in the time specified, it re-appeared in the evacuations or was eliminated unchanged. From this it has been very generally assumed, not only that the amount named may be retained, but that it must of necessity be so used or re-combined as to evolve some kind of sustaining force. For a long time it was claimed the retained alcohol underwent oxydation, and evolved heat. When this was fully demonstrated to be erroneous by the direct application of the clinical thermometer, by all experimenters from my own in 1850 to the present time, § it was then assumed that its consumption resulted either directly or indirectly in the evolution of nerve force. But here again the crucial test of direct experimental observation soon showed, that so far as the motor and sensory nerve and muscular functions are concerned, both were diminished in direct ratio to the quantity of alcohol taken.

While the presence of alcohol in the blood slightly increases the frequency of the action of the heart, it renders its systole shorter and quicker, while it simultaneously so modifies the vaso-motor nerve influence over the whole system of smaller vessels and capillaries as to retard the

* Du Role de l'Alcool et des Anesthesiques dans l'Organism, Paris, 1860.
† Physiological Memoirs, pp. 43 to 50.
‡ Diseases of Modern Life, pp 220 and 230, New York, 1883.
§ Even the extended observations of Dr. Parkes and Count Wallowicz, led only to negative results in this regard.

current of blood in them and to cause their manifest dilatation. Consequently, the sphygmographic line is made to rise more abruptly with the cardiac systole and fall still more quickly in the diastole, with a slight wavy or unsteady character of the line before the next systole, giving to the tracing characters closely resembling the pulse line of typhoid fever.*

The increased frequency of the pulse led Dr. Parkes and Count Wallowicz to make an interesting mathematical calculation of the supposed increased amount of work done by the heart under the influence of alcohol as compared with the normal standard.

Their results under eight days daily use of alcohol, gave an average of over 14,000 beats per day more than without the alcohol, from which they estimated that the heart did an amount more of work per day equal to the lifting of from fifteen to twenty tons one foot. The language used by these observers in stating the foregoing results, has created the manifestly erroneous impression, that the heart, under the influence of alcohol, is made to do so much more actual efficient work in the circulation of the blood; whereas the increased frequency of the beats is more than counterbalanced by the diminished influence of the vaso-motor nerves on the coats of the smaller vessels, causing them to become unnaturally full from the retardation of the blood currents in them.† The truth is that under the influence of alcohol in the blood, the systolic action of the heart loses in sustained force in direct proportion to its increase in frequency, until by simply increasing the proportion of alcohol, the heart stops in diastole, as perfectly paralyzed as are the coats of the smaller vessels throughout the system. This was admirably demonstrated by the recent experimental investigation of Professor Martin, of the Johns Hopkins University, Maryland, on the effects of different proportions of alcohol on the action of the heart of the dog,‡ and of Drs. Sidney Ringer and Harrington Sainsbury, to determine the relative strength of the different alcohols, as indicated by their influence on the action of the heart of the frog.§ These latter eminent experimenters say in closing their report on the action of the alcohols, "that by their direct action on the cardiac tissue, these drugs are clearly *paralyzant*, and that this appears to be the case from the outset, *no stage of increased force of contraction* preceding." Professor Martin states the results obtained by him as follows: "Blood containing one eighth per cent. by volume of absolute alcohol has no immediate action on the isolated heart. Blood containing one fourth per cent. by volume, that is two and a half parts per thousand of absolute alcohol, almost invariably remarkably diminishes, within a minute, the work done by the heart; blood containing one half per cent. always diminishes it, and may even bring the amount pumped out by the left ventricle to so small a quantity, that it is not sufficient to supply the coronary arteries." Professor Martin estimates one fourth per cent., or two and a half parts per thousand, of the blood of an adult man, weighing 150 pounds, to be only fifteen cubic centimeters (fl. ʒiv), an amount only equal to that contained in an ordinary glass of brandy or whisky.‖ These investigations of Professor Martin, directly corroborated by those of Drs. Ringer and Sainsbury, complete the series of demonstrations needed to show the actual effects of alcohol on the cardiac, as well as the vaso-motor nerves, and also on the direct contractibility of the muscular structure, when supplied with blood containing all

* See Chicago Medical Examiner, Vol. VIII, p. 522, 1867.
† Diseases of Modern Life by B. W. Richardson, p. 216.
‡ See Journal of the American Medical Association, Vol. 1, page 307.
§ See *The Practitioner*, London. May, 1883, and Journal of American Medical Association, Vol. 1, page 272.
‖ Maryland Medical Journal for September, 1883.

gradations in the relative proportion of alcohol, leaving no longer a refuge for the idea, popular both in and out of the profession, that alcohol in any dose is capable of increasing, even temporarily, the force or efficiency of the heart's action. It is certain, therefore, that if a small proportion of the alcohol taken in the various fermented and distilled liquids is retained in the living body, or can not be actually reproduced in the eliminations within a limited time, such retained portion is neither used for the evolution of heat, the increase of nerve force, the efficiency of muscular contraction, nor yet for quickening molecular movements in the processes of nutrition, disintegration and secretion. Consequently, the assumption that if any part of the alcohol taken is retained for a time, at least, it must from necessity be converted into some kind of force or energy, is not sustained by any known facts, either of scientific experiment or of clinical experience. On the contrary, it acts in the same direction as chloroform, ether, and all the other members of the same chemical group of substances, namely, as an anæsthetic to nerve sensibility, a relaxant of muscular tone or contractibility, and a retarder of molecular movements in the tissues; these effects being produced in direct ratio to the amount taken, relatively to the whole weight of the individual taking it. That the action of alcohol in the human system is in all respects similar, except in being slower, to that of chloroform and ether, was fully demonstrated by the direct investigations of Dr. Anstie, who concludes this part of the subject with the following important declaration: "A general review of the phenomena of alcohol-narcosis enables me to come to one distinct conclusion, the importance of which appears to be very great, namely, that (as in the case of chloroform and ether) the symptoms which are so commonly described as evidences of excitement, depending on a *stimulation* of the nervous system preliminary to the occurrence of narcosis, are in reality an essential part of the narcotic, that is, the *paralytic* phenomena."* So far from being justified in the common assumption that all the alcohol, not capable of being detected in the eliminations during twenty-four or forty-eight hours after it is taken, is converted into some kind of force, there is positive proof that it remains unchanged, and can be detected in the living tissues long after it ceases to be detected in either the breath, perspiration or urine. Thus the same author just quoted, says on page 368: "Nothing is more plainly proved by M. M. Lallemand, Duroy and Perrin, than the fact that long after the latest periods at which any of the alcohol absorbed can be recognized in the breath, the urine, or the sweat, *unchanged* alcohol in notable quantities can be recognized in the blood and tissues of the alcoholized animal. M. Baudot justly observes that there is no necessity to suppose that this substance must be transformed *immediately*, if transformed at all, in the organism." And I may add, in view of the fact that the most varied and scrutinizing researches of different investigators have entirely failed to find any products of such transformation, either in the form of matter or force, there is no probability that such transformation ever does take place; but that the retained alcohol is held simply by a strong affinity for the albuminoid constituents of the blood and tissues, retarding by its presence the natural affinities and movements of such constituents, and being detached and eliminated by the slow process of disintegration, and disappearance of the atoms by which it is held. It is exactly this retained alcohol that causes in the habitual moderate drinker, those slow, but certain deteriorations of structure in the liver, kidneys, cardiac and vascular

*See Stimulants and Narcotics, Their Mutual Relations, etc., by Francis E. Anstie, M. D., M. R. C. P., page 357.

walls and structures, generally described by pathologists under the head of fatty and atheromatous degenerations. That part of the alcohol taken which finds ready elimination, contributes to the direct anæsthetic effect, and more prominent temporary functional disturbances, but leaves little permanent impression on the living structures.

From all the foregoing considerations we may formulate the following propositions:

First. That alcohol, when taken diluted in the form of fermented or distilled spirits, is rapidly absorbed without change, carried into the blood, and with that fluid brought in contact with every structure and part of the human body.

Second. That while circulating in the blood, its presence retards those molecular or atomic changes which constitute nutrition, disintegration and secretion, and on which the phenomena of life depend.

Third. That its presence in the living system retards the elimination of waste matter, impairs nerve sensibility, lessens muscular excitability and contractibility, and lowers the temperature of the body.

Fourth. That a large part of the amount taken is rapidly eliminated with the various excretions, and there is no evidence whatever that such part as may be retained a longer period, is either assimilated or converted into any form of force.

These propositions are as well established as any facts in the domain of physiology, or in the whole field of natural science, and they point with all the clearness and force of a mathematical demonstration to the conclusion that alcohol is in no sense food; neither furnishing material for the tissues, nor fuel for combustion, nor yet generating either nervous or muscular force. Having thus determined, experimentally, that alcohol is neither food nor a generator of force in the living body, the question recurs, what are its positive effects when taken in the ordinary manner? I answer, simply those of an anæsthetic and organic sedative. Like ether and chloroform, its presence diminishes the sensibility of the nervous system and brain, thereby rendering the individual less conscious of all outward and exterior impressions. This diminution of sensibility, or anæsthesia, is developed in direct ratio to the quantity of alcohol taken, and may be seen in all stages, from simple exemption from all feeling of fatigue, pain, and idea of weight, exhibited by ease, buoyancy, hilarity, etc., to that of complete unconsciousness, and loss of muscular power. It is this anæsthetic effect of alcohol that has led to all the popular errors and contradictory uses which have proved so destructive to human health and happiness. It has long been one of the noted paradoxes of human action, that the same individual would resort to the same alcoholic drink to warm him in winter, protect him from the heat in summer, to strengthen when weak or weary, and to soothe and cheer when afflicted in body or mind. With the facts now before us, the explanation of all this is apparent. The alcohol does not relieve the individual from cold by increasing his temperature, nor from heat by cooling him, nor from weakness and exhaustion by nourishing his tissues, nor yet from affliction by increasing nerve power, but simply by diminishing the sensibility of his nerve structures, and thereby lessening his consciousness of impressions, whether from cold or heat, or weariness or pain. In other words, the presence of the alcohol has not in any degree lessened the effects of the evils to which he is exposed, but has diminished his consciousness of their existence, and thereby impaired his judgment concerning the degree of their action upon him.

It is this property of alcohol to produce that sense of ease, buoyancy and exhilaration, arising from a moderate diminution of nerve sensibility,

that gives it the fascinating and delusive power over the human race which it has wielded so ruinously for centuries gone by. But while the presence of alcohol diminishes the sensibility of the nervous structure, it also retards all the molecular changes, thereby diminishing the activity of nutrition, secretion, elimination and the evolution of heat, constituting a true organic sedative. When taken in small quantities, repeated daily, the individual usually slowly increases in weight, not from increased nutrition, but from retarding the waste and retaining the old atoms longer in the tissues. By some investigators this power to retard atomic changes and consequently to retain the old atoms has been regarded as equivalent to nutrition, or the actual assimilation and addition of new atoms. It is on this basis that Dr. Hammond and a few others persist in representing alcohol as indirect food.* The fallacy of such claim, and its mischievous tendency, will be fully apparent by reference to one of the plainest laws governing living animal matter. The law is, that all the phenomena of animal life are associated with and dependent on atomic changes, and that each individual cell or aggregation of bioplasm constituting an organic atom, has its determinate period of growth, maturity and dissolution. Hence, to introduce into the living system any agent that will retard atomic change, is equivalent to retarding the phenomena of life. And if by retarding the atomic changes, cells or atoms are retained in the tissues longer than the natural duration of their activity, such retention may increase the bulk and weight, but in the same ratio it embarrasses the tissues with the presence of material which is constantly becoming inert and tending to degeneration. Consequently, the individual who thus increases his bulk and weight by taking just enough of the weaker alcoholic drinks daily to retard the processes of secretion and waste, in the same proportion diminishes his activity, his power of endurance, and his ability to resist the effects of morbid agents of every kind. This is abundantly illustrated by the thousands of beer and wine drinkers, who from twenty to twenty-five years of age were muscular, active, capable of any reasonable endurance, with a weight of 150 pounds, but who, after moderately retarding atomic changes and retaining old atoms by the daily use of wine or beer, have acquired a weight of 200 pounds or more, and have lost their muscular activity and endurance to such an extent that an active exercise of twenty minutes would make them entirely out of breath. It is this sedative effect of alcohol on the organic or molecular changes in the tissues, retaining waste and effete matter, that ought to have been promptly disintegrated and thrown out, which impairs the vital properties, and predisposes or prepares the system to yield to morbid influences of any kind to which it may be exposed. And especially does this sedative effect of alcohol on the organic changes, when maintained by a moderate and continued use of the article, favor those degenerative changes which result in tubercular, caseous, and fatty deposits in the lungs, liver, kidneys, heart and arteries of the brain, and in materially shortening the duration of life. It is the same interference with the processes of nutrition and waste, only exerted more actively, that causes gastritis and delirium tremens in the excessive drinker of distilled spirits. If you ask for the special *modus operandi* of alcohol, how it produces its anæsthetic and sedative effect when taken into the human system, I answer, chiefly by its strong affinity for water and albumen. The two last named substances exist in the blood and all the tissues of the body, and for them alcohol has a strong chemical affinity. Hence, when it is present in the blood, it attracts the

* A Treatise on Hygiene, with Special Reference to Military Service, 1863, p. 35.

water from the blood corpuscles, causing them to become more or less corrugated, and inclined to adhere to one another as described by Dr. Richardson, of London, and diminishing the capacity of the blood to absorb oxygen or other gases from the air in the lungs; and by its strong affinity for the albumen of the tissues, it retards the play of vital affinity between that substance and the other materials with which it is in contact, thereby retarding the molecular changes as already described. The paralyzing effect exerted on the vaso-motor as well as cerebro-spinal nervous structures by which sensibility is impaired, is owing partly to the direct anæsthetic properties of the alcohol, and partly to the diminished interchange of oxygen for carbonic acid gas in the process of respiration. That a part of the alcohol should be retained for a considerable length of time in the system by the affinities just mentioned, is very probable. Hence the late Dr. Anstie may have been correct in claiming that it was not all eliminated from the system within any limited period of time, and yet its retention would afford no proof that it was either appropriated as food or for the generation of force.

On the contrary, the catalytic influence of its presence retards both. If we scan the whole domain of physiology and pathology in connection with the logical deductions from the experimental researches by parties widely separated by time, space, nationality and language, we shall be forced to the conclusion that alcohol, as found in any or all of the fermented and distilled drinks, is neither stimulating, strengthening, nor nourishing to the human system, but simply anæsthetic and sedative.

What then are the therapeutic indications they are capable of fulfilling in the treatment of disease? First. By the anæsthetic properties of the alcohol they contain, they are capable of diminishing nerve sensibility and muscular force, in the same manner as other well-known anæsthetics.

But from the slower development of the effects of the alcohol, and the still slower disappearance of those effects, the liquids containing it are far inferior for all practical anæsthetic purposes, to chloroform, ether or nitrous oxide, and are consequently seldom used in that capacity, except to relieve pain and promote sleep in certain conditions of nervous unrest. And here, again, they are far less efficient and more liable to secondary bad consequences than the bromides, chloral, and the numerous class of milder anodynes and antispasmodics familiar to every intelligent physician.

Second. By the power of alcohol to retard the evolution of heat in retarding molecular changes in the tissues, the liquids containing it may be used as antipyretics when the temperature is too high, and to retard the processes of waste when these are too rapid. But the antipyretic influence of alcohol is so feeble in comparison with the proper application of water to the surface, or with the internal administration of sulphate of quinia, salicylic acid, digitalis, etc., that no one thinks of using it for antipyretic purposes.

The power of alcoholic liquids to retard the molecular changes in the blood and tissues, and thereby lessen the rapidity of tissue change, really constitutes the basis on which rests the use of a large part of what is prescribed by the profession at the present day in the treatment of the sick. In this, however, there are involved two fallacies of much importance. The first arises from the failure to discriminate between the loss of flesh and strength from a failure or diminution of the processes of assimilation and nutrition by which the natural tissue waste is replaced by new matter, and the loss of flesh and strength from simple excess of

rapidity in the processes of disintegration or tissue waste while the reparative processes remain natural.

The second consists in the assumption, that retarding molecular movements in such manner as to lessen the rapidity of natural change or disintegration of tissue is equivalent to the maintenance of tissue integrity by the assimilation and addition of new matter; the falsity of which I have already pointed out.

There is, indeed, no more mischievous error existing either in or out of the profession, at this time, than that of regarding the loss of flesh, whether from disease or overwork, as generally due to increased disintegration instead of diminished nutrition. The first existing alone as a primary morbid condition is exceedingly rare, while the latter is present, to some extent, in nearly all the morbid conditions met with. And yet alcohol is, even theoretically, applicable only to cases of the first, while practically, as shown by clinical experience, it is not adapted to the successful treatment of either of the conditions named. For while its presence in the blood retards tissue change, it does it by equally retarding the molecular movements concerned in the processes of assimilation, nutrition and secretion. Consequently while its first impression is often delusively beneficial, its continuance for one, two or three weeks almost invariably develops a diminution of appetite for food, an impairment of the digestive function, or manifest derangements in the excretory functions.

An infinitely better method of promoting nutrition and maintaining the healthy balance between it and waste, consists in a full supply of pure air, a sufficient supply of plain digestible food, and the judicious regulation of the hours of exercise and rest, both mental and physical. To supplement these with any form or quantity of alcohol, is entirely superfluous; and to attempt to substitute the latter in the place of any one of the former, only leads more speedily and certainly to disastrous failure. In cases requiring any other aid to the nutritive processes and the maintenance of general tonicity, besides pure air, good food, and a proper regulation of exercise and rest, the hypophosphites of calcium, sodium and iron, the lactophosphates of calcium and iron, the ordinary preparations of iron, and the bitter infusions may be resorted to with advantage.

The two therapeutic indications I have now passed in review are the only ones that can be founded on the known and demonstrated effects of alcohol on the functions and structures of the human body. But there are two others supposed to exist by a large portion of the profession and of the community. One of these is founded on the supposed ability of the alcohol to strengthen the action of the heart and sustain the circulation generally. It is to fulfill this, that the alcoholic liquors are so extensively used in the typhoid and many other low forms of febrile disease. And yet you have already seen that the entire series of facts derived from the whole field of experimental investigation, proves that the presence of alcohol exerts a paralyzing influence over the whole vaso-motor system of nerves and finally paralyzes the heart itself, and wherever the proper tests have been applied, the results of experimental research have been corroborated by clinical experience. It is now thirty-five years since I commenced the direct clinical study of the effects of alcohol as a remedial agent. I have used the spygmograph and all other means of testing the strength of the heart and the efficiency of the circulation, in every variety of the low forms of febrile disease coming under my observation, and I have never yet found an instance in which it increased the cardiac force or the efficiency of the general circulation. But I have seen many cases in

which it so impaired the vaso-motor influence as to greatly increase passive congestion in the lungs and other vascular structures, and that, too, while its anæsthetic influence in quieting restlessness, caused the patients to appear comfortable, and to say they were better, even up to the time of relaxation of the sphincters and the occurrence of involuntary discharges. I have repeatedly, under such circumstances, stopped entirely the administration of alcoholic remedies and in their place given strychnine and the mineral acids, alternated with suitable doses of digitalis, caffeine, or infusion of coffee with milk, and wheat-flour and milk gruel for nourishment, with the most satisfactory results. Strychnia, digitalis, convallaria, cactus grandiflora, caffeine and theine, are true vaso-motor and cardiac tonics, with none of the paralyzing influences of alcohol, and none of the secondary tissue degenerative tendencies possessed by the latter.

They are consequently admirably adapted to fulfill the indications presented in the lower types of acute general diseases, for which alcoholic preparations have so long been prescribed injuriously on a false basis. The second popular therapeutic indication is founded on the equally false idea, that alcohol is capable of acting, at least as a temporary stimulant, in arousing nerve sensibility and sustaining cardiac action in cases of threatened syncope, shock, and other forms of sudden and severe depression or exhaustion. But the same fatal objection lies against its use for fulfilling this indication as in the immediately preceding one; namely that the alcohol acts as a *paralyzant* and anæsthetic from the first drop to the last, and in no sense as a stimulant. If you ask me how it happens that a remedy that does, not only no good, but is directly calculated to do harm, can so long and universally maintain its reputation, both in and out of the profession, in such cases, I answer, that it does so solely by reason of two facts: First, that ninety and nine of every hundred cases of threatened or actual syncope, shock, nervous prostration and sinking, for which alcoholic liquids are so hurriedly used, would and do recover just as quickly and more certainly, if simply placed at rest in fresh air without a drop of alcohol in any form. But as such cases are sometimes severe enough to require some prompt and judicious treatment, we have in the corbonate and aromatic spirits of ammonia, and the preparations of camphor, far more speedy and efficient remedies for immediately arousing sensibility, especially when aided by a few sudden dashes of cold water upon the face and chest, and in the caffeine, digitaline, convallaria, etc., the proper cardiac tonics for restoring permanent steadiness and force to the circulation. I speak the more positively on this subject, gentlemen, because, for more than thirty years past I have faithfully tested the correctness of the sentiments I have given you in relation to the therapeutic effects and uses of alcoholic liquids in an ample clinical experience both in hospital and private practice; and during all that time I have found no case of disease and no emergency arising from accident, that I could not treat more successfully without any form of fermented or distilled liquors than with. It is easy to see that the anæsthetic properties of alcohol can be made available by an intelligent and skillful physican to meet a very limited number of indications in the treatment of some cases that will come before him. But the same intelligence and skill will enable him to select other remedies capable of meeting the same indications more perfectly, and, with less tendency to secondary bad effects. I have no hesitation, therefore, in stating that for the attainment of the highest degree of success in the management of all forms of disease, whether acute or chronic, we need no form of fermented or distilled alcoholic drinks. Pure alcohol for chemical, pharmaceutical and manufacturing purposes, is all that is necessary or valu-

able to be derived from this class of agents. And whoever will boldly make the trial, will find that his patients, of every kind, will make better progress, on good air and simple nourishment, without any admixture of alcoholic liquids, than they will with such addition. In other words he will find that the supposed benefits of this class of agents in medicine, are as illusory as they are in general society, and that the words of the wise man are worthy of careful consideration when he says: "Wine is a mocker and strong drink is raging, and whosoever is *deceived* thereby is not wise."

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